BLM LIBRARY
88069915

COPE PROGRAM
ANNUAL REPORT FOR FY 94

QH
541.5
.C65
C637
1994b

#1227319043

ID 88069915

QH
541.5
.C65
C637
1994b

COPE PROGRAM ANNUAL REPORT FOR FY 94

1 TABLE OF CONTENTS
INTRODUCTION

2 MEETING AGENDA
MINUTES OF COPE ADVISORY COUNCIL MEETING
JUNE 9, 1994

3 ADVISORY COUNCIL MEMBERS
COOPERATING ORGANIZATIONS

4 ANNUAL REPORTS:
Fundamental Studies

5 Adaptive Studies and
Technology Transfer Activities

6 WORK PLANS FOR NEW STUDIES

7 RELATIONSHIPS OF RESEARCH STUDIES TO MANAGEMENT ISSUES AND RESEARCH TASKS

8 BUDGET SUMMARIES
FOR FY 94 AND FY 95

BUREAU OF LAND MANAGEMENT LIBRARY
BLDG. 50,
DENVER FEDERAL CENTER
P.O. BOX 25047
DENVER, COLORADO 80225

MultiDex
Title Page/54700

WilsonJones.

©1990 Wilson Jones Company

1

MultiDex™
Quick Reference Index System

COPE Program

FY 94

Annual Report

Table of Contents

Item Page

Introduction i

Meeting Agenda iii

Minutes of COPE Advisory Council Meeting of June 9, 1994 v

COPE Advisory Council Members vii

Cooperating Organizations ix

Annual Reports:

Fundamental COPE 1

Adaptive COPE and Technology Transfer Activities 107

Work Plans for New Studies 163

Relationship of Research Studies to COPE Management Issues
and Research Tasks 173

Budgets Summaries (FY 94 and FY 95):

Fundamental COPE 187

Adaptive COPE 189

Compiled by Steve Hobbs (Program Manager) Forestry Sciences Laboratory, 3200 S.W. Jefferson Way, Corvallis, OR 97331. (503) 750-7426.

Dear Cooperators:

This report summarizes the research and technology transfer activities of COPE scientists during fiscal 1994. I am pleased to report to you that the year was marked by considerable progress. During the year there were 38 fundamental and adaptive research studies underway of which seven were completed (see pages 23, 35, 43, 73, 93, 129, and 137). The final two replications of the commercial thinning and structural diversity study were harvested on the Waldport and Hebo Districts of the Siuslaw National Forest (see pages 145-148). Further to the north, harvesting began on the most ambitious commercial thinning and wildlife study ever undertaken in the Oregon Coast Range (see page 149). Located on the Oregon Department of Forestry's Tillamook State Forest and lands owned by Stimson Lumber Company, this study will yield valuable insight on how to manage second growth forests for timber and wildlife. In addition, all three replications of two cooperative studies designed to integrate upslope timber harvesting with riparian enhancement have now been installed on lands owned by Starker Forests and Menasha (see pages 65 & 133). Preliminary results from two of the replications indicate that riparian enhancement operations can be successfully completed and cost effective using skyline yarding equipment. I am also excited by the progress that has been made in the Coastal Landscape and Modeling Study (CLAMS). This research represents cutting edge science that may have broad applications. (see page 25)

Extended education continues to be an important part of the COPE Program. During last year our commitment to education was best exemplified by the symposium "The Ecology and Management of Oregon Coast Range Forests" held at Gleneden Beach and attended by more than 250 people. Planned and coordinated by the Adaptive COPE team, this symposium represented just one of the many ways in which technology transfer occurred during fiscal 1994. We are also concerned that the public become more aware of COPE research and the implications for resource management. Frankly, we have not been very successful in this arena but this is likely to change in the near future. The Oregon Forest Resources Institute (OFRI) has taken an interest in the COPE Program and as a result has funded the preparation of a short film on the COPE Program and the development of a COPE communications plan. Work on both of these projects will begin in early fiscal 1995. Leslie Lehmann, Executive Director of OFRI, will discuss the work with the COPE Advisory Council during their November 22 meeting.

After eight years, the Program remains on course and continues to be financially sound. Each year brings new and exciting discoveries, none of which would have been possible without your support. Thank you for your continued confidence in the work we have undertaken.

Steve Hobbs
Program Manager

2

MultiDex™
Quick Reference Index System

AGENDA

COPE Advisory Council Meeting
LaSells Stewart Center, OSU
Corvallis, Oregon
November 22, 1994

Time	Topic	Discussion Leader
10:00 a.m.	Welcome and Introductory Remarks	Barte Starker
10:05	Opening Comments	George Brown Charles Philpot
10:15	Fundamental COPE FY 94 Overview	Steve Hobbs
	Wildlife Studies Update	Bill McComb
	Coastal Landscape Analysis and Modeling	Tom Spies
	CLAM	Norm Johnson
	Dynamic Landscapes and Fish	Gordon Reeves
11:35	Adaptive COPE FY 94 Overview	John Hayes
12:15 p.m.	Lunch (hosted)	
12:45	Oregon Forest Resources Institute Support for COPE	Leslie Lehmann
1:00	Continuation of Selected Research beyond FY 98	Steve Hobbs
1:30	Other Business	Barte Starker
2:00	Adjourn	

Minutes of the COPE Advisory Council Meeting
Library, Hatfield Marine Science Center
Newport, Oregon
June 9, 1994

Council members present: Mel Chase, John Christie, Mike Collopy, Ray Craig, Dennis Creel, Don Davis, Ron Heninger (vice John Wilkinson), Ron Kortlever (vice Gary Varner), Nancy MacHugh, Joyce Morgan, Steve Morris, Ed Obermeyer (vice Jim Furnish), Mike Propes, Barte Starker, and Al Tocchini.

Others present: Nancy Boyer, George Brown, Bill Emmingham, John Hayes, Steve Hobbs, Charlie Philpot, Bart Thielges, and Vicki Verdugo.

Barte Starker welcomed the group to the Spring Advisory Council Meeting. Barte then commented on the new riparian regulations recently adopted by the Oregon Board of Forestry, stating that COPE was a major contributor.

George Brown welcomed the new Advisory Council members, Mike Collopy of the National Biological Survey and Steve Morris of the National Marine Fisheries Service. He mentioned the COPE symposium held in March and said he considered it a big success because it provided new and interesting information, particularly about wildlife-related research.

Following a round of self-introductions, Charlie Philpot related how the COPE organization is used as a model of collaborative programs in discussions at the national level within the Forest Service.

Barte asked if there were any corrections to the minutes of the Fall 1993 meeting. There were none and the minutes were unanimously approved.

Steve Hobbs reviewed the meeting agenda and then gave an overview of Fundamental COPE. During the year, two former cooperators rejoined the Program. These were Lane County and Lone Rock Timber Company. To date 20 studies have been completed and 38 studies are in progress. Steve then discussed two new proposals to develop a slope stability management tool and a management guide for laminated root rot.

Bill Emmingham gave an overview of Adaptive COPE and highlights of the symposium held at Gleneden Beach in March. He then presented a brief status report on three adaptive studies: "The Application of Commercial Thinning to Increase Structural Diversity in Young Douglas-fir Stands", "Influence of Woody Debris Piece Size on Function in Small Streams," and "Pruning and Fertilizing Commercially Thinned Douglas-fir Stands in the Oregon Coast Range."

John Hayes updated the Council on the "Influence of Snag Creation and Commercial Thinning Intensity on Stand Structure and Bird Abundance and Diversity in Managed Forests in the Oregon Coast Range" study. Three replications are located on the Tillamook State Forest with a fourth on lands owned by Stimson Lumber Company. Cooperation has been excellent and thinning harvests should start this summer. John was then followed by Bill Emmingham who covered the technology transfer activities of the Adaptive COPE Team.

George Brown brought the Council up-to-date on COPE's proposal to the Oregon Forest Resources Institute (OFRI), regarding assistance with external communications. The proposal was approved by the OFRI Board and they have agreed to fund the services of a communications/public relations professional to advise COPE and develop a communications plan. A request for proposals has been sent out by OFRI.

Steve Hobbs presented the FY 95 proposed budget for Adaptive COPE. He said that carryover would continue to decrease as the program winds down. Cooperator pledges for FY 95 were as follows: National Biological Survey, $151,000; National Forests, $80,000; industry, $150,000; Oregon Department of Forestry, $80,000; Oregon Department of Fish and Wildlife, $5,000; Counties, $27,500; Bureau of Indian Affairs, $5,000; and City of Newport, $1,000. Steve Hobbs said that he was confident that the U.S. Fish and Wildlife Service would also contribute $5,000 for FY 95. Ray Craig commented that we need to watch expenditures carefully to ensure adequate funds to complete the program as planned.

The issue of an indepth program review, as specified in the COPE Long-Range Plan, to be completed in time for the fall 1994 Advisory Council meeting was discussed. The Council decided a review was unnecessary. However, several Council members expressed concern about what happens when COPE is completed in 1998. Nancy MacHugh and Ron Heninger both emphasized the fact that we have made a significant investment in research and that some studies may yield even more important results if continued beyond 1998. There was general agreement among Council members on this issue and Barte Starker asked Steve Hobbs to develop a proposal for the fall 1994 meeting to address the issue of which studies should be continued beyond 1998.

The meeting adjourned at 12:05 p.m.

Minutes by Steve Hobbs, Program Manager

3

MultiDex™
Quick Reference Index System

October 1994

ADVISORY COUNCIL MEMBERS

John Byrne
U.S. Fish and Wildlife Service/AFF
1002 NE Holladay Street
Portland, OR 97232-4181
(503) 230-5973

✓ Mel Chase, District Manager
Bureau of Land Management
1300 Airport Road
North Bend, OR 97459
(503) 756-0100

✓ John Christie Sarah
Route 5, Box 852
Astoria, OR 97103
(503) 325-2834

Michael Collopy
National Biological Survey
3200 SW Jefferson Way
Corvallis, OR 97331
(503) 750-7330

✓ Ray Craig
Oregon Department of Forestry
2600 State Street
Salem, OR 97301
(503) 945-7204

Dennis Creel
Willamina Lumber Company
P. O. Box 8
Willamina, OR 97396
(503) 876-2322

Don Davis
Chamber of Commerce
555 S.W. Coast Highway
Newport, OR 97365
(503) 265-3718

✓ Jim Furnish, Forest Supervisor
Siuslaw National Forest
P. O. Box 1148
Corvallis, OR 97333
(503) 750-7008

✓ Mike Hicks
Boise Cascade Corporation
450 Pacific Avenue, North
Monmouth, OR 97361
(503) 838-1610

Russell Hoeflich
The Nature Conservancy
Oregon Field Office
1205 N. W. 25th Avenue
Portland, OR 97210
(503) 228-9561

✓ Nancy MacHugh
Oregon Department of Fish
and Wildlife
7118 N. E. Vandenberg Avenue
Corvallis, OR 97330
(503) 757-4186

✓ Joyce Morgan
County Commissioner
Douglas County Courthouse
Roseburg, OR 97470
(503) 440-4201

Steve Morris
National Marine Fisheries Service
911 N.E. 11th Avenue, Ste. 620
Portland, OR 97232
(503) 230-5431

Gina Mulford
County Commissioner
Tillamook County Courthouse
201 Laurel Avenue
Tillamook, OR 97141
(503) 842-3403

Mike Propes
County Commissioner
Polk County Courthouse
Dallas, OR 97338
(503) 623-8173

Tom Robinson
Oregon Salmon Commission
P. O. Box 1033
Newport, OR 97365
(503) 265-2437

Gerald Rust
County Commissioner
Lane County Board of Commissioners
125 E. 8th Avenue
Eugene, OR 97401
(503) 687-4203

✓ Barte Starker, Advisory Council Chair
Starker Forests
P.O. Box 809
Corvallis, OR 97339
(503) 929-2477

✓ Al Tocchini, Parks Forester
Oregon Parks & Recreation Dept.
1115 Commercial Street, NE
Salem, OR 97310-1001
(503) 378-5020 x245

✓ Gary Varner Ron Kortlever
Bureau of Indian Affairs
Siletz Agency
P. O. Box 569
Siletz, OR 97380-0569
(503) 444-2597

✓ John Wilkinson, Vice President
Weyerhaeuser Company Jim Romback
P.O. Box 275
Springfield, OR 97477
(503) 746-2511

COPE PROGRAM COOPERATORS

Federal Agencies
- Bureau of Indian Affairs
- Bureau of Land Management
- National Biological Survey
- Pacific Northwest Research Station
- Siskiyou National Forest
- Siuslaw National Forest
- U.S. Fish and Wildlife Service

State Agencies
- Department of Fish and Wildlife
- Department of Forestry
- Oregon State University
- Oregon Forest Resources Institute

Oregon Counties
- Benton
- Coos
- Curry
- Douglas
- Josephine
- Lane
- Lincoln
- Polk
- Washington

Forest Industries
- Boise Cascade Corporation
- Georgia-Pacific Corporation
- Giustina Land & Timber Company
- Hydraulic & Machine Services, Incorporated
- Lone Rock Timber Company
- Longview Fibre Company
- Menasha Corporation
- Roseburg Resources Company
- Starker Forests, Incorporated
- Stimson Lumber Company
- Weyerhaeuser Company
- Willamette Industries, Incorporated
- Willamina Lumber Company

City of Newport

Oregon Small Woodland Association

4

MultiDex™
Quick Reference Index System

LIST OF ANNUAL REPORTS FOR FY 1994
FUNDAMENTAL COPE STUDIES

Page

I. *Riparian Zone Management*

A. Ecology and Inventory of Riparian Zone Vegetation (Tom Spies and Jim Sedell, PNW; John Tappeiner, NBS/OSU) 5

B. Fish Habitat and Riparian Zone Interactions (Stan Gregory, Bob Beschta, and James Hall, OSU; Fred Everest, Gordon Reeves, Jim Sedell, and Fred Swanson, PNW; Peter Bisson and Robert Bilby, Weyerhaeuser) 9

C. Wildlife Habitat and Wildlife Diversity in Riparian Zones: A Gradient Approach (Bill McComb, Bob Anthony, Chuck Meslow and Joseph Beatty, OSU) 13

D. Hybrid Poplar in Coastal Riparian Zones for Non-point Source Pollution Control, Fish and Wildlife Habitat, and Wood Fiber (Jim Sedell, PNW; Bill Emmingham, Dave Hibbs and Stan Gregory, OSU) 19

E. Ground Water Movement in Steep Forested Hill-slopes with Particular Focus on Marginally Stable "Head-walls" (Marvin R. Pyles, Hank Froehlich and Arne Skaugset, OSU) 23

F. Coastal Landscape Analysis and Modeling (Thomas Spies, Joseph Means, Gordon Reeves, Gay Bradshaw, Warren Cohen, PNW; William McComb, John Sessions, Rebecca Johnson, Stanley Gregory, and Norm Johnson, OSU) 25

G. The Dynamics and Silviculture of Riparian Vegetation (David Hibbs, William Emmingham, OSU; John Tappeiner, NBS/OSU; Samuel Chan, PNW) 29

H. Disturbance History, Channel State, Fish Habitat, and Fish Production in Sandstone Basins of the Central Oregon Coast (Fred Everest, Gordon Reeves and James Sedell, PNW; Lee Benda, Univ. of Washington) 35

Page

I. Behavior of Debris Torrents and Effects on Anadromous Fish Habitat in the Oregon Coast Range (Fred Everest, Gordon Reeves and James Sedell, PNW; Lee Benda, Univ. of Washington) 39

J. Estimation of Smolt Production from Lobster Creek Study Basin (Fred Everest, Gordon Reeves and James Sedell, PNW; Stanley Gregory, OSU) 43

K. Ecology and Habitat Relationships of Selected Riparian-Associated Wildlife (Robert Anthony, Charles Meslow, and William McComb, OSU) 45

L. The Utilization of Unconstrained Stream Reaches by Salmonids in the Oregon Coast Range (Gordon Reeves and James Sedell, PNW) 49

M. Evaluation of Anadromous Salmonid Habitat Restoration Program on Schooner Creek, Hebo Ranger District, Siuslaw National Forest (James Sedell and Gordon Reeves, PNW; Robert Metzger, USFS; Northwest Steelheaders) 53

N. Strength Behavior of Forest Soils Under True Field Stresses (Richard Bell, Warren Schroeder, and Marv Pyles, OSU) 57

O. Integrating and Managing Recreation with Other Resources (Perry Brown and George Stankey, OSU; Roger Clark,PNW) 61

P. Harvesting Alternatives in Upland and Riparian Areas in the Oregon Coastal Range (Loren D. Kellogg, OSU) 65

Q. Economic Analysis of Forest Management--Fisheries Interactions (Susan J. Alexander, PNW) 69

R. Management Policies for Increasing Recreation's Contribution to the Economies of Oregon Coast Range Communities (Rebecca L. Johnson and Kreg Lindberg, OSU) 73

Page

II. *Reforestation in the Oregon Coast Range*

A. Ecology and Management of Shrubs and Hardwoods in Coastal Forests (John Tappeiner NBS/OSU; Steve Radosevich, OSU; John Zasada and Sam Chan, PNW) 77

B. Second Decade Effects of Site Preparation on Tree and Vegetation Development With and Without Precommercial Thinning (Bill Stein and Pete Owston, PNW) 81

C. Species Manipulation as a Strategy to Reduce the Impact of Laminated Root Rot in Regenerated Coastal Stands (Walt Thies, PNW) 85

D. Characterization of Trichoderma spp.: Prelude to Biological Control (Earl Nelson, PNW) 89

E. Rate of Spread of Phellinus weirii in Living vs Dead Root Systems (Earl Nelson, PNW) 93

F. Decision Support System for Reforestation in the Oregon Coast Range (Lauri Shainsky and Pat Cunningham, PNW; Steve Knowe and Steve Radosevich, OSU) 95

G. Understory Response to Thinning in Young Douglas-fir Stands (Sam Chan, Don Minore, and Peyton W. Owston, PNW; Gabriel F. Tucker, William H. Emmingham, John P. Hayes, Arne Skaugset, Barbara Schrader, OSU; Stuart Johnston, Siuslaw National Forest) 99

H. Economic Strategies and Analysis of Regeneration Alternatives in Coastal Oregon with Constrained Site Treatment Alternatives (J. Douglas Brodie and Stephen D. Hobbs, OSU) 103

October 1994

Fundamental COPE
Annual Report

1. *Title*:

Ecology and Inventory of Riparian Zone Vegetation

2. *Principal Investigator(s) and Organization(s)*:

Dr. Thomas A. Spies, Research Forester, Pacific Northwest Research Station, Corvallis
Dr. John C. Tappeiner, Senior Research Forester, National Biological Survey, and Professor, Department of Forest Resources, College of Forestry, OSU, Corvallis
Dr. James R. Sedell, Research Ecologist, Pacific Northwest Research Station, Corvallis

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Identify and explain the effects of various riparian and stream conditions on fish populations and communities.

b. Characterize wildlife communities in riparian and adjacent upland habitats and assess how changes in habitat affect wildlife species.

c. Develop silvicultural systems to maintain and improve fish and wildlife habitats in riparian areas and increase conifer development there.

d. Identify and integrate associations among ecosystem components (for example, vegetation, geomorphology, fish) in riparian areas and explain their ecological relationships.

4. *Study Objective(s)*:

a. Conduct an inventory of major vegetation types for representative subbasins within three Oregon Coast Range basins using photogrammetric and remote sensing techniques.

b. Characterize existing riparian vegetation structure and spatial distribution within representative basins according to stream size, valley width and gradient, geomorphology and other factors.

c. Characterize vegetation and large woody debris dynamics in streamside forests.

d. Determine response of streamside vegetation to flooding, mass movement, and other natural disturbances.

5. *Potential Benefit or Utility of the Study*:

Currently, the vegetative species composition, structure, stocking, and density are unknown for coastal Oregon riparian zones. A riparian vegetation inventory is fundamental and essential to any study of riparian zones in coastal Oregon. Quick results are necessary in order to select research sites for both extensive and intensive basin and stand level studies. The survey will also be necessary for any economic modeling effects.

Management of riparian zones is severely hindered by a lack of information about the ecological characteristics and dynamics of riparian zone vegetation. Vegetation is closely linked to stream processes, fish habitat, wildlife habitat, and regeneration of commercially valuable timber species. However, relatively few studies of the structure and ecology of riparian zone vegetation have been undertaken in the Oregon Coast Range. In order to develop comprehensive management plans that allow for multiple resource benefits from active riparian zone management, information on the ecology of riparian vegetation must be developed and provided to managers and other COPE scientists.

6. *Research Activities*:

a. Accomplishments in FY 94:

Conducted analysis of regional patterns in tree seedling densities and plant communities.

Remeasured plots for regeneration and disturbance study.

Monitored reference stand mortality.

Conducted analysis of spatial patterns in reference stands.

Results indicate that understory conifer regeneration is sparse in young to mid-aged conifer stands across topographic gradients. Regeneration appears to be more common where canopy disturbances have occurred and seed sources are available.

b. Problems Encountered in Meeting Research Obligations for FY 94:

The resignation of a key research assistant has delayed progress in publishing results and remeasuring plots.

c. Planned for FY 95:

Use mortality data in conjunction with coarse woody debris model to evaluate wood input rates from reference stands.

Monitor regeneration and disturbance plots.

d. Tasks to be Completed by Fiscal Year Starting in FY 96:

FY 1996
Continue mortality survey.

Complete analysis of coarse woody debris inputs based on mortality.

Monitor regeneration and disturbance plots.

Complete final data analysis.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

Pabst, R., J. Tappeiner, and T. Spies. Productivity of riparian and upslope forests in the Oregon Coast Range. (submitted)

Pabst, R., S. Splean, G. Spycher, and T. Spies. Developing a stem map model in a geographic information system (GIS) from field survey data. (submitted)

Spies, T., R. Pabst, J. Tappeiner, and N. Poage. Structure, composition and productivity of riparian vegetation in the Oregon Coast Range. In: The Ecology and Management of Oregon Coast Range Forests: A mid-term COPE Symposium. Gleneden Beach, Oregon. March 29-30, 1994.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

None.

c. Planned for FY 95:

Complete and submit manuscripts on (1) vegetation communities and (2) geomorphology-vegetation relationships.

8. *Estimated Cost*:

	OSU	*PNW*	*TOTAL*
FY 94	129,000	58,000	187,000
FY 95	37,000	48,000	85,000
FY 96	39,000	38,000	77,000

9. *Duration of the Study*:

Initiation Date:	FY 87
Scheduled Completion Date:	FY 96

October 1994

Fundamental COPE
Annual Report

1. *Title*:

Fish Habitat and Riparian Zone Interactions

2. *Principal Investigator(s) and Organization(s)*:

Dr. Stanley V. Gregory, Associate Professor, Department of Fisheries and Wildlife, College of Agricultural Sciences, OSU, Corvallis
Dr. Robert L. Beschta, Professor, Department of Forest Engineering, College of Forestry, OSU, Corvallis
Dr. Fred H. Everest, Research Fish Biologist, Pacific Northwest Research Station, Corvallis
Dr. Gordon H. Reeves, Research Fish Biologist, Pacific Northwest Research Station, Corvallis
Dr. James R. Sedell, Research Ecologist, Pacific Northwest Research Station, Corvallis
Dr. Frederick J. Swanson, Research Geologist, Pacific Northwest Research Station, Corvallis
Dr. James D. Hall, Professor, Department of Fisheries and Wildlife, College of Agricultural Sciences, OSU, Corvallis
Dr. Peter Bisson, Fish Biologist, Weyerhaeuser Company, Tacoma, Washington
Dr. Robert Bilby, Fish Biologist, Weyerhaeuser Company, Tacoma, Washington

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Identify and explain the effects of various riparian and stream conditions on fish populations and communities.

b. Identify and explain how various management practices in streams and riparian areas affect fish populations and communities and water quality.

c. Develop silvicultural systems to maintain and improve fish and wildlife habitats in riparian areas and increase conifer development there.

d. Identify and integrate associations among ecosystem components (for example, vegetation, geomorphology, fish) in riparian areas and explain their ecological relationships.

4. *Study Objective(s)*:

To describe relationships between riparian zones and critical fish habitat and to provide a foundation for basin-wide fisheries management.

a. To describe relationships between the distribution and abundance of salmonids and the geomorphic characteristics of basin landforms as a foundation for managing fisheries resources within entire drainage basins.

b. To describe the influence of riparian zone composition and structure on the distribution and abundance of salmonids.

c. To identify management strategies for maintaining riparian characteristics critical for salmonid populations in coastal basins.

d. To evaluate practices for mitigating loss of riparian resources or habitat for fisheries of coastal drainages. (This objective will be developed in future years as a basin context is developed for interpretation.)

5. *Potential Benefit or Utility of the Study*:

A variety of social, political, and environmental factors are forcing rapid change in management of fish habitat through the management of riparian zones, large woody debris, and instream structures. These management activities are seldom considered in a basin-wide context, a perspective that is essential for successful management of the fishery resource, particularly where mixed ownership patterns prevail.

Results of this study will provide vital data for planning, designing, and implementing management plans for riparian zones and fish habitat. Criteria will be developed for identifying critical areas of fish habitat.

6. *Research Activities*:

a. Accomplishments in FY 94:

Evaluated fish population responses in Alsea Watershed study streams. Coho juvenile populations remained similar to pre-harvest levels, but cutthroat trout numbers are a third of previous populations in the clearcut watershed. Beaver dams in the control stream doubled numbers of coho and cutthroat trout per stream length.

Fish populations responded to woody debris complexity in the Camp Creek restoration project. Cutthroat trout numbers and total fish numbers were greater in pools with greater amounts of wood. Coho numbers in summer were not related to amounts of wood. However, coho growth rates increased fourfold with addition of food at high wood complexity, and growth was substantially lower with low complexity of wood.

Evaluated basin-wide patterns of stream temperature for 1991-1993 through the TEMP-86 Temperature Model. Related changes in fish communities in different reaches to stream temperatures.

Inventoried fish communities in the habitat complexity experiment in Camp Creek to determine long-term efficacy of habitat restoration approaches.

Assessed fish communities in the Alsea Watershed Study streams as part of a long-term analysis of trends in coastal salmonid stocks and year-to-year variability in fish stocks.

Examined mechanisms responsible for patterns of salmonid distributions at scales ranging from individual habitat units to stream reaches to river basins.

b. Problems Encountered in Meeting Research Obligations for FY 94:

None.

c. Planned for FY 95:

Develop basin-scale fish habitat model.

Synthesize information for coastal Oregon basins.

Investigate mechanisms related to fish habitat patterns emerging from synthesis.

d. Tasks to Be Completed By Fiscal Year Starting in FY 96:

FY 1996
Complete synthesis of information for coastal Oregon basins.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

Presented three papers and two field trip presentations for COPE Symposium "Ecology and Management of Oregon Coast Range Forests". Gleneden Beach, Oregon. March 29-31, 1994.

Presented three papers at Symposium on Pacific Salmon and their Ecosystems in Seattle, WA on Jan. 10-11, 1994.

Presented invited seminar on Stream Restoration at University of Alabama in November.

Led a conference on Conservation of Pacific Salmon at Oregon State University on April 27-28, 1994.

Completed publication of responses of fish communities in the Alsea Watershed Study.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

Graduate student still writing thesis.

c. Planned for FY 95:

Develop preliminary model of woody debris dynamics in stream.

Synthesize and publish results of COPE research.

Steve Fieth's completion of thesis on stream restoration responses in Camp Creek.

Participate in field trips, seminars, and workshops.

8. *Estimated Cost*:

	OSU	*PNW*	*TOTAL*
FY 94	137,000	123,000	260,000
FY 95	92,000	91,000	183,000
FY 96	62,000	63,000	125,000

9. *Duration of the Study*:

Initiation Date:	FY 87
Scheduled Completion Date:	FY 96

October 1994

Fundamental COPE
Annual Report

1. *Title*:

Wildlife Habitat and Wildlife Diversity in Riparian Zones: A Gradient Approach

2. *Principal Investigator(s) and Organization(s)*:

Dr. William C. McComb, Professor, Department of Forest Science/Department of Fisheries and Wildlife, OSU, Corvallis
Dr. Robert G. Anthony, Leader, Oregon Cooperative Wildlife Research Unit, National Biological Survey, Department of Fisheries and Wildlife, OSU, Corvallis

3. *Management Issues and Research Tasks (COPE Long-Range Plan, 3-6)*:

Riparian Zone Management

a. Identify wildlife species in and adjacent to riparian habitats.

b. Characterize wildlife communities in riparian and adjacent upland habitats and assess associations between habitat and wildlife species.

c. Develop silvicultural systems to maintain and improve fish and wildlife habitats in riparian areas.

d. Identify and integrate associations among ecosystem components (for example, vegetation, geomorphology, fish) in riparian areas and explain their ecological relationships.

4. *Study Objective(s)*:

a. Determine the relative abundance of vertebrate species and quantify patterns of vertebrate community structure and diversity along transriparian and intrariparian gradients in Coast Range watersheds.

b. Quantify wildlife habitat along transriparian and intrariparian gradients in a representative set of Coast Range watersheds.

c. Extensively sample habitat and vertebrate communities at sites throughout the Coast Range that represent a continuum of habitat conditions.

d. Develop and test hypotheses regarding the response of species and communities to changes in vegetation structure and composition within and adjacent to riparian zones.

e. Evaluate opportunities to manipulate vegetation to optimize simultaneous production of wildlife habitat and timber.

5. *Potential Benefit or Utility of the Study*:

There is currently almost no information which permits objective evaluation of tradeoffs for wildlife management in riparian zones. Controversies over the current Forest Practices Rules makes the need for this information a high priority. The goal of this research is to provide this needed information. Riparian zones receive water, nutrients and energy from upstream sources along the stream gradient, so they are potentially very productive ecosystems. They could add significantly to the food base of a watershed, thereby affecting vertebrate community structure. Variability in food and cover ought to be maximized through time along three spatial gradients: parallel to the stream (increasing floodplain size), perpendicular to the stream (moisture gradient), and vertically from the forest floor to the canopy. Characteristics of the stream and adjacent forest will influence these gradients. Research will be directed to provide information to develop prescriptions at a basin level in coordination with fisheries and forest ecologists working on other COPE projects.

6. *Research Activities*:

a. Accomplishments in FY 94:

Completed analysis of relationship between landscape structure and pattern and breeding bird communities.

Initiated studies on birds and amphibians in buffer strips of varying widths.

Initiated landscape modeling study of bird-habitat relationships.

Continued sampling of intrariparian gradients.

Completed report on bird communities in managed and unmanaged subbasins.

Began sampling birds and amphibians in buffer strips of varying widths. (Small mammals will be covered in supplementary landscape study funded by NBS)

Continued sampling stream amphibians in riparian buffers and unmanaged streams.

Began developing bird-habitat relationships models to be used with the CLAMS project.

b. Problems Encountered in Meeting Research Obligations for FY 94:

None.

c. Planned for FY 95:

Continue studies on buffer strip widths.

Continue bird-habitat relationships model development.

d. Tasks to Be Completed by Fiscal Year Starting in FY 96:

FY 1996
Analyze data and prepare reports describing the results of intrariparian bird communities and influence of buffer strip width on bird and amphibian communities. (Small mammals will be addressed in study funded by NBS)

Prepare report on predicting abundance or presence of birds over complex landscapes.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

Hagar, J. C. and W. C. McComb. Bird communities in commercially thinned and unthinned Douglas-fir stands of western Oregon. Annual Meeting of the Oregon Chapter of the Wildlife Society. Sun River, Oregon. February 1994.

Hope, S. and W. C. McComb. 1994. Perceptions of implementation and monitoring of wildlife tree prescriptions on National Forests in western Washington and Oregon. Wildlife Society Bulletin (in press).

McComb, W. C. Bird responses to silvicultural systems and associations with landscape pattern in Oregon. Dept. of Conservation and Land Management, Como, Western Australia. December 10, 1993 (invited).

McComb, W. C. Red alder: Interactions with wildlife. Red Alder Biology and Management Symposium. Oregon State University, Corvallis, Oregon. 1993 (invited).

McComb, W. C. High quality forestry: Implications for wildlife associated with old, unmanaged conifer stands. High Quality Forestry Workshop, USDA Forest Service. Silver Falls, OR. 1993 (invited).

McGarigal, K. Bird communities in coast range riparian ecosystems. COPE symposium "Ecology and Management of Oregon Coast Range Forests." Gleneden Beach, Oregon. March 1994.

McGarigal, K. Relationship between landscape structure and breeding birds in the Oregon Coast Range. COPE symposium "Ecology and Management of Oregon Coast Range Forests." Gleneden Beach, Oregon. March 1994.

McGarigal, K. The measurement of landscape structure with applications using program FRAGSTATS. Workshop. Corvallis, OR. 1994.

McGarigal, K. The measurement of landscape structure with applications using program FRAGSTATS. Workshop. Corvallis, OR. December, 1993.

McGarigal, K. Avian community structure in relation to landscape structure. USDA Forest Service Land Management Planning Workshop, Fort Collins, CO. (invited)

McGarigal, K. Introduction to landscape ecology. Short course. Corvallis, OR. April 1994.

Gomez, D. M. and R. G. Anthony. Small mammals and amphibians in Coast Range riparian ecosystems. COPE Symposium on the Management and Ecology of Oregon Coast Range Forests, Gleneden Beach, Oregon. March 1994.

McComb, W. C., K. McGarigal, and R. G. Anthony. 1993. Small mammal and amphibian use of riparian and upslope habitats in unmanaged central Oregon Coast Range stands. Northwest Science 67:7-15.

McComb, W. C., T. A. Spies, and W. H. Emmingham. 1993. Stand management for timber and mature-forest wildlife in Douglas-fir forests. Journal of Forestry 91(12):31-42.

McComb, W. C. 1994. Red alder: Interactions with wildlife. In: D. E. Hibbs et al., eds. Biology and management of red alder, OSU Press, Corvallis. p. 131-138.

McComb, W. C. 1994. High quality forestry: Implications for wildlife associated with old, unmanaged conifer stands. p. 74-92. In: J. Weigand, ed. High Quality Forestry Workshop Proceedings, USDA Forest Service Gen. Tech. Rep.

McGarigal, K. 1993. Relationships between landscape structure and avian abundance patterns in the Oregon Coast Range. Ph.D. dissertation, Oregon State University, Corvallis. 274 p.

McGarigal, K. and B. J. Marks. 1994. FRAGSTATS: A spatial pattern analysis program for quantifying landscape structure. USDA Forest Service Gen. Tech. Rep. (in press)

McGarigal, K. and W. C. McComb. Relationship between landscape structure and breeding birds in the Oregon Coast Range. (submitted to Ecological Monographs)

Preparing a manuscript on intrariparian patterns in bird communities.

Preparing a manuscript on intrariparian patterns of stream amphibian communities.

Preparing a manuscript on snag patterns in Coast Range basins.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

None.

c. Planned for FY 95:

McComb, W. C., K. Leidholt-Bruner, N. Suzuki, and D. E. Hibbs. Effects of beaver on streamside woody vegetation in coastal Oregon streams. (draft)

Hayes, J. P. and W. C. McComb. Landscape Genetics: The application of conservation genetics to managed landscapes. (draft)

8. *Estimated Cost*:

	OSU
FY 94	134,000
FY 95	148,000
FY 96	150,000

9. *Duration of the Study*:

Initiation Date: FY 88
Scheduled Completion Date: FY 96

October 1994

Fundamental COPE
Annual Report

1. *Title*:

Hybrid Poplar in Coastal Riparian Zones for Non-point Source Pollution Control, Fish and Wildlife Habitat, and Wood Fiber

2. *Principal Investigator(s) and Organization(s)*:

Dr. James R. Sedell, Research Ecologist, Pacific Northwest Research Station, Corvallis
Dr. William H. Emmingham, Silviculturist, Department of Forest Science, OSU, Corvallis
Dr. David E. Hibbs, Silviculturist, Department of Forest Science, OSU, Corvallis
Dr. Stanley V. Gregory, Fisheries Biologist, Department of Fisheries and Wildlife, OSU, Corvallis

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Identify and explain how various management practices in streams and riparian areas affect fish populations and communities and water quality.

b. Develop silvicultural systems to maintain and improve fish and wildlife habitats in riparian areas and increase conifer development there.

4. *Study Objective(s)*:

a. Monitor and measure the development of hybrid poplar and Knobcone-Monterey pine hybrid (KMX) established in riparian zones of streams adjacent to farm or pasture land in the Oregon Coast Range.

b. Monitor concentrations of nitrates at three depths in the soil profile across the transect of each poplar and alder buffer strip.

c. Monitor changes in bank stability and fish habitat complexity as hybrid poplar and alder stands develop.

5. *Potential Benefit or Utility of the Study*:

The best potential fish habitat in coastal Oregon is often on farmland and land near estuaries. However, in these areas bank stability, the physical configuration of fish habitat, and water quality are often in poor condition. Water quality problems related to non-point source pollution include high temperatures, high bacteria levels, and high nitrate concentrations. In Europe and the eastern United States it is well known that forest buffers can retain as much as 89 percent of the nitrogen and 80 percent of the phosphorous runoff associated with adjacent land use practices. Even narrow riparian forest strips are effective filters particularly when adjacent to cropland. Small side channels and the merger of rivers are potentially excellent salmonid habitat. However, due to past human disturbance, many of these areas are currently unproductive rearing habitat for young salmonids.

Hybrid poplar plantations are used successfully in France for fish and wildlife habitat, groundwater nutrient filters, and fiber. On test plots in the Pacific Northwest, hybrid poplar can grow to over 60 feet high and attain a diameter of more than 7 inches within eight years. The French model should be tested along the Oregon Coast where, if successful, it would represent an excellent example of forest management and environmental protection resulting in better fish and wildlife habitat, cleaner rivers and bays, and an alternative high yield fiber supply. Demonstration plantations need to be started along the coast on farmland, followed by intensive sampling of groundwater moving through the plantations. The demonstration sites will provide an early assessment of the length of time required to stabilize stream banks and effectively filter nutrients from groundwater entering streams.

6. *Research Activities*:

a. Accomplishments in FY 94:

Completed a Masters Thesis Study Plan for "The investigation of vegetative uptake and denitrification in Willamette Valley, Oregon riparian buffer areas for controlling agricultural non-point source pollution."

Plantation tending as necessary.

Collected growth data; litter fall.

Began collection of denitrification data.

b. Problems Encountered in Meeting Research Obligations for FY 94:

During the 1993 and 1994 growing seasons, the Knobcone-Monterey pine hybrids planted before the 1993 growing season did very poorly and are now considered a failure.

c. Planned for FY 95:

Collect and analyze growth and denitrification data.

d. Tasks to be Completed by Fiscal Year Starting in FY 96:

FY 1996
Complete final analysis of growth and denitrification data.

Prepare a manuscript that summarizes study results.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

None.

Participated in field trips, seminars, and workshops, as appropriate.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

None.

c. Planned for FY 95:

Participate in field trips, seminars, and workshops, as appropriate.

8. *Estimated Cost*:

	PNW	*OSU*	*TOTAL*
FY 94	46,000	24,000	70,000
FY 95	37,000	26,000	63,000
FY 96	39,000	23,000	62,000

9. *Duration of the Study*:

Initiation Date:	FY 89
Scheduled Completion Date:	FY 96

October 1994

Fundamental COPE
Annual Report

1. *Title*:

Groundwater Movement in Steep Forested Hill-Slopes with Particular Focus on Marginally Stable "Head-Walls"

2. *Principal Investigator(s) and Organization(s)*:

Dr. Marvin R. Pyles, Associate Professor, Department of Forest Engineering, OSU, Corvallis
Dr. Henry A. Froehlich, Professor, Department of Forest Engineering, OSU, Corvallis
Mr. Arne E. Skaugset, Instructor, Department of Forest Engineering and Adaptive COPE Program, OSU, Hatfield Marine Science Center, Newport

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Develop, refine, and test systems for predicting and reducing landslides, surface erosion and sediment delivery to stream channels.

4. *Study Objective(s)*:

a. Review published analytical modeling methods for applicability to steep forest slope groundwater regimes.

b. Attempt measurements of the distribution of groundwater flow in a steep forested slope between saturated flow, unsaturated flow, and macro-pore or pipe flow.

c. Estimate hydraulic constants for groundwater flow in steep forest slopes.

d. Investigate site to site differences that relate to groundwater flow within a homogeneous sample of forest slopes.

5. *Potential Benefit or Utility of the Study*:

Debris avalanches from steep slopes are and will continue to be the focus of discussions about best management practices in the Oregon Coast Range. Attempts to manage forest land in such a way as to avoid the most unstable terrain are moving in the direction of quantitative assessment of slope stability as a part of the management planning process. Central in the quantitative assessment of slope stability is the pore water pressure used in the particular slope stability equation selected. This value of pore water pressure is currently obtained either by simple assumption, or from empirical groundwater functions of doubtful broad geographic validity. Best assessments of slope instability will be made only if a broadly applicable groundwater model can be developed. This study is an essential first component in the development of improved groundwater models.

6. *Research Activities*:

a. Accomplishments in FY 94:

We continued to collect groundwater data from two field sites.

Completed collection of winter/spring 93-94 groundwater data.

Processing and analysis of the field data which consists of over 100 megabytes of computer files is in progress.

b. Problems Encountered in Meeting Research Obligations for FY 94:

The amount of data and some special processing requirements have caused the data analysis portion of the project to take longer than originally planned.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

None.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

The extra time needed for data analysis has resulted in the delay of a project report and journal articles.

8. *Estimated Cost*:

	OSU
FY 94	22,000

9. *Duration of the Study*:

Initiation Date: FY 90
Scheduled Completion Date: FY 94

October 1994

Fundamental COPE
Annual Report

1. *Title*:

Coastal Landscape Analysis and Modeling

2. *Principal Investigator(s) and Organization(s)*:

Dr. Thomas A. Spies, Research Forester, Pacific Northwest Research Station, Corvallis
Dr. K. Norm Johnson, Professor, Department of Forest Resources, OSU, Corvallis
Dr. Joseph E. Means, Research Forester, Pacific Northwest Research Station, Corvallis
Dr. Gordon H. Reeves, Research Fish Biologist, Pacific Northwest Research, Corvallis
Dr. William C. McComb, Associate Professor, Department of Forest Science, OSU, Corvallis
Dr. John Sessions, Professor, Department of Forest Engineering, OSU, Corvallis
Dr. Gay A. Bradshaw, Research Mathematician, Pacific Northwest Research Station, Corvallis
Dr. Warren Cohen, Research Forester, PNW, Corvallis
Dr. Rebecca L. Johnson, Associate Professor, Department of Forest Resources, OSU, Corvallis
Dr. Stanley V. Gregory, Fisheries Biologist, Department of Fish and Wildlife, OSU, Corvallis

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Identify and integrate associations among ecosystem components (for example, vegetation, geomorphology, fish) in riparian areas and explain their ecological relationships.

4. *Study Objective(s)*:

Objective 1: Characterize the pattern and dynamics of vegetation, habitat, and human activity in the Coast Range Physiographic Province.

Objective 2: Develop policy analysis tools including spatial data bases, spatial ecological change models, monitoring approaches, and ecological and economic effects models at the subregional/regional scale.

Objective 3: Compare and contrast alternative approaches to large (landscape to subregional level) ecosystem analysis and policy.

5. *Potential Benefit or Utility of the Study*:

The goal of COPE research is to find ways to enhance productivity of the multiple resources derived from streams, riparian zones, and forests of the Oregon Coast Range. This requires understanding relationships among geomorphology, stream characteristics, aquatic organisms, wildlife, and riparian and upland vegetation. Many of these components are considered in individual COPE studies, but no framework exists for integrating these studies and developing knowledge of the relationships involved.

This study will increase coordination of conceptual approaches, field sampling, data analysis, and data management. For example, we will examine factors regulating the distribution of fish and wildlife within selected drainage basins. This study will guide acquisition of a geographic information system (GIS) for COPE. This is a powerful tool for integrating landscape-scale work in several disciplines and analysis of spatial patterns of key resources.

The most important issues facing forest land managers today span a range of spatial scales from stands and streams to the subregion (e.g., Oregon Coast Range) and region (e.g., western Oregon and Washington). Changing vegetation and land use patterns have lead to changes in local, sub-regional economies, and distribution and abundance of anadromous fish and wildlife populations. The ability to rapidly assess and monitor vegetation composition and structure across large land areas will greatly benefit managers and policy makers and help inform the public.

A map of the current state (1993 or 1994) of vegetation/land use/habitat conditions in the central Oregon Coast Range would provide a visual and digital spatial model of how important aspects of ecosystem structure and composition vary across a range of scales that are important to local economies and sensitive fish and wildlife species.

An understanding of the rates and patterns of change in vegetation and land use for 1972-1993 is necessary to understand how these multibasin ecosystems arrived at their current vegetative and land use state. It can also be an important step toward interpreting changes in human, fish and wildlife communities and developing a monitoring system capable of detecting important changes in vegetation and land use.

Development and comparison of landscape models for analysis of future conditions of vegetation, fish habitat and wildlife habitat will be the vehicle for scientists to integrate their understanding of the effects of vegetation and land use changes in these multibasin ecosystems on these important response variables and identify information gaps. Comparison of alternative future scenarios of landscape condition and their implications to biodiversity and economics would provide important information for managers, policymakers and the public.

6. *Research Activities*:

a. Accomplishments in FY 94:

We have developed work teams and are holding regular planning meetings.

We have developed a prototype vegetation change model.

Completed initial classification of 1988 satellite image to produce a vegetation map.

Compiled database of about 800 ground plots from several sources for verifying satellite vegetation classification and met one requirement for building vegetation model.

Continued ground sampling of vegetation.

Obtained 1993 TM imagery.

Began analysis of vegetation and land use changes.

Began development and comparison of landscape models of vegetation pattern and change, wildlife habitat suitability and fish habitat suitability.

Began integrating economics into the study.

b. Problems Encountered in Meeting Research Obligations for FY 94:

Three principal investigators were on sabbatical leave during FY 94.

c. Planned for FY 95:

Complete final version of vegetation/land use map.

Complete retrospective analysis of landscape change.

Continue development of landscape models.

Begin development of alternative future scenarios.

d. Tasks to be Completed by Fiscal Year Starting in FY 96:

FY 1996
Complete development of landscape models.

Compare effects of alternative management scenarios on economics and biodiversity.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

Spies, Thomas, Joe Means, Norm Johnson, Warren Cohen, Bill McComb, Gordon Reeves, and Steve Garman. Coastal landscape analysis and modeling study. In: The Ecology and Management of Oregon Coast Range Forests: A mid-term COPE symposium. Gleneden Beach, Oregon. March 29-30, 1994.

Participated in field trips, seminars, and workshops, as appropriate.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

None.

c. Planned for FY 95:

Participate in field trips, seminars, and workshops, as appropriate.

8. *Estimated Cost*:

	OSU[1]	PNW	TOTAL
FY 94	30,000	283,000	313,000
FY 95	157,000	297,000	454,000
FY 96	124,000	288,000	412,000

9. *Duration of the Study*:

Initiation Date:	FY 90
Scheduled Completion Date:	FY 96

---

[1] As a point of further collaboration, some resources from the OSU studies "Wildlife Habitat and...A Gradient Approach" (page 13) and "Ecology and Inventory of Riparian Vegetation" (page 5) were also devoted to this study in addition to the funds shown starting in FY 94. This work will entail wildlife habitat and vegetation modeling, and on the ground vegetation sampling in riparian zone and adjacent uplands.

October 1994

Fundamental COPE
Annual Report

1. *Title*:

The Dynamics and Silviculture of Riparian Vegetation

2. *Principal Investigator(s) and Organization(s)*:

Dr. David E. Hibbs, Associate Professor, Department of Forest Science, OSU, Corvallis
Mr. Samuel Chan, Plant Physiologist, Pacific Northwest Research Station, Corvallis
Dr. William H. Emmingham, Professor, Department of Forest Science, OSU, Corvallis
Dr. John C. Tappeiner, National Biological Survey, Professor, Department of Resources, College of Forestry, OSU, Corvallis

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Develop silvicultural systems to maintain and improve fish and wildlife habitats in riparian areas and increase conifer development there.

4. *Study Objective(s)*:

a. Determine the effects of harvest entry type and intensity, landform, vegetation type, upslope activity, and time since entry on tree regeneration, understory development, and overstory dynamics (succession, mortality, windthrow, diversity) by sampling the spectrum of existing buffer strip conditions.

b. Develop systems of tree regeneration in riparian areas and descriptions of (1) how these systems affect fish and wildlife habitat characteristics and growing conditions, and (2) how these regeneration systems can be integrated into adjacent upslope management.

c. Develop the information base and methodology required to manage the riparian overstory to maintain or achieve a desired plant composition and structure through manipulation of mixes of tree and shrub species in groups of different sizes and at different densities.

Two guidelines apply to all study objectives. First, the spectrum of riparian area activities studied will range from no disturbance, through partial overstory removals, to complete harvest and will include intensive regeneration and stand management practices. Second, all characterizations of vegetation and the effects of manipulations on vegetation will be measured and described in terms useful to fisheries, wildlife and timber resource managers. Opportunities will be sought to coordinate this study with other COPE research.

5. *Potential Benefit or Utility of the Study*:

Riparian area plant communities are extremely diverse, and their structure and composition is a major determinant of fish and wildlife habitat. Likewise, the tree component can represent a sustainable source of forest products. Consequently, the management and successional dynamics of riparian area vegetation can have a major effect on the productivity of fish, timber, and wildlife resources. Unfortunately, little is known about how to manage riparian area vegetation to achieve specific habitat characteristics. Historically, management practices in riparian areas have shifted from maximum to minimum disturbance and the creation of buffer strips, primarily to protect the fisheries resource. However, in many Coast Range riparian areas, future habitat characteristics desirable for fish, timber, and wildlife may be delayed or foregone because current practices may not facilitate adequate tree regeneration and may not perpetuate desired community structure and composition.

This study will explore both the short- and long-term effects of riparian area management practices on the timber resource and on vegetation-related fish and wildlife habitat characteristics. It will provide much needed information on the growing conditions created by different silvicultural strategies and thus allow resource managers to choose appropriate methods to achieve specific vegetation characteristics in riparian areas. This will increase the resource manager's ability to eventually reach the desired mix of fish, timber, and wildlife required to meet management objectives.

6. *Research Activities*:

a. Accomplishments in FY 94:

Completed conifer buffer sampling.

Initiated new study of riparian cover types in undisturbed forest.

Completed fourth (Indian Creek) and third (Elk Creek) year growth measurements at riparian regeneration/growing condition sites.

Measured and analyzed changes in the light and soil moisture on riparian regeneration sites.

Analyzed soils to characterize the variability of soils and drainage on regeneration sites.

Began sampling in cover type study.

Continued measurement of vegetation dynamics and microenvironment on regeneration sites.

Began evaluation of relative shade tolerance of underplanted species.

Continued data analysis.

Results: Alder-dominated buffer strips are surprisingly biologically stable. We found little difference in composition, structure, or community dynamics between buffer strips and intact riparian forest.

Except for red alder, we found little difference in growth and survival of six underplanted tree species, after three years, under a thinned (60% overstory canopy opening) when compared to trees planted under conditions where the red alder overstory was completely removed.

The canopies of thinned stands of red alder began to develop and close at rates between 12% to 15% per year beginning the third year after thinning. Thus, monitoring and further thinning of the alder canopy will likely be necessary to maintain the growth of underplanted trees.

Significant reductions in the regrowth of salmonberry cut annually did not occur until the third year.

b. Problems Encountered in Meeting Research Obligations for FY 94:

None.

c. Planned for FY 95:

Thinning of seedlings on regeneration sites.

Continue data collection and analysis.

d. Tasks to be Completed by Fiscal Year Starting in FY 96:

FY 1996
Complete data analysis and prepare manuscripts summarizing study results.

Prepare proposal for long-term monitoring of vegetation dynamics on regeneration sites.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

Dynamics of riparian buffer strips. In: The Ecology and Management of Oregon Coast Range Forests: A mid-term COPE symposium. Gleneden Beach, Oregon. March 29-31, 1994.

Dynamics of planted conifers and hardwoods in the understory of hardwood-dominated riparian zones. In: The Ecology and Management of Oregon Coast Range Forests: A mid-term COPE symposium. Gleneden Beach, Oregon. March 29-31, 1994.

Regeneration of riparian areas: Interaction of site and vegetation factors. In: The Ecology and Management of Oregon Coast Range Forests: A mid-term COPE symposium. Gleneden Beach, Oregon. March 29-31, 1994.

Environmental characteristics of hardwood and shrub dominated riparian areas in the coast range: Description and measurement. In: The Ecology and Management of Oregon Coast Range Forests: A mid-term COPE symposium. Gleneden Beach, Oregon. March 29-31, 1994.

Hardwood Silviculture Cooperative. In: The Ecology and Management of Oregon Coast Range Forests: A mid-term COPE symposium. Gleneden Beach, Oregon. March 29-31, 1994.

Presentation on riparian silviculture to COPE Advisory Council meeting. Bureau of Land Management, Salem, Oregon. November 23, 1993.

Presented seminar to watershed and analysis teams on measurement and evaluation of hardwood-dominated riparian canopies. Bureau of Land Management, Salem District. March 1993.

Giordano, P. A. and D. E. Hibbs. Vegetation characteristics of alder-dominated riparian buffer strips in the Oregon Coast Range. (submitted)

Presented workshops on "Riparian management on small woodlands: Shaping policies and prescriptions." Corvallis, Oregon, January 21-22, 1994 and Medford, Oregon, February 11-12.

"Planting conifers in riparian areas." Oregon Department of Forestry Annual Silviculture Workshop. Veneta, Oregon. June 21-22, 1994.

Participated in field trips, seminars, and workshops as appropriate.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

None.

c. Planned for FY 95:

Develop manuscript on dynamics of conifer-dominated buffer strips.

Prepare **COPE Report** on effects of thinning red alder-dominated riparian areas to increase understory light levels.

Participate in field trips, seminars, and workshops as appropriate.

8. *Estimated Cost*:

	OSU	*PNW*	*TOTAL*
FY 94	65,000	61,000	126,000
FY 95	66,000	64,000	130,000
FY 96	57,000	67,000	124,000

9. *Duration of the Study*:

Initiation Date:	FY 90
Scheduled Completion Date:	FY 96

October 1994

Fundamental COPE
Annual Report

1. *Title*:

Disturbance History, Channel State, Fish Habitat, and Fish Production in Sandstone Basins of the Central Oregon Coast

2. *Principal Investigator(s) and Organization(s)*:

Dr. Fred H. Everest, Research Fish Biologist, Pacific Northwest Research Station, Corvallis
Dr. Lee E. Benda, Graduate Student/Staff, Department of Geological Sciences and Fishery Research Institute, University of Washington, Seattle ,Washington
Dr. Gordon H. Reeves, Research Fish Biologist, Pacific Northwest Research Station, Corvallis
Dr. James R. Sedell, Research Ecologist, Pacific Northwest Research Station, Corvallis

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Identify and explain the effects of various riparian and stream conditions on fish populations and communities.

b. Identify and explain how various management practices in streams and riparian areas affect fish populations and communities and water quality.

4. *Study Objective(s)*:

Establish the spatial and temporal relationship between natural and human disturbances in central coast sandstone basins and successional state of riparian vegetation, stream channel state, fish habitat characteristics, and fish populations and community structure.

5. *Potential Benefit or Utility of the Study*:

Habitat characteristics of stream channels are influenced by riparian vegetation. The structure and composition of fish communities is in turn a function, at least in part, of habitat conditions. Little is known about changes in habitat and fish community characteristics following natural disturbance events. Even less is known about how these things change as the stream system and associated riparian zone recover over time. Knowledge of the recovery of stream systems from natural disturbance events will provide a temporal and spatial context for the management of riparian areas. This temporal and spatial context, particularly the temporal aspects, is lacking in current management schemes. This knowledge will provide a better understanding of the long-term role of riparian vegetation in stream systems and will be incorporated into riparian management schemes.

6. *Research Activities*:

a. Accomplishments in FY 94:

Completed sampling of old sites.

Completed field sampling at new sites.

Streams in the central coast of Oregon may experience a range of habitat conditions over time as a result of large catastrophic disturbance. The disturbance is large landslides that result from failure of hillslopes following wildfire. These events deliver large amounts of wood and sediment to the channel. Fish habitat is initially simplified. Over time as sediment is routed from the system and wood is exposed from the deposits and recruited from the riparian areas habitat complexity decreases. Habitat complexity may decrease if the system remained undisturbed for extended periods (i.e. 200+ years). The assemblage of juvenile anadromous salmonids varies with channel conditions. It is most diverse during the period of highest habitat complexity and lowest during periods of decreased habitat complexity.

b. Problems Encountered in Meeting Research Obligations for FY 94:

None.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

Benda, L. Stochastic geomorphology in a humid mountain landscape. Ph.D. dissertation. University of Washington. 356 p.

A disturbance-based ecosystem approach to maintaining and restoring freshwater habitat for anadromous salmonids.(draft)

Publish study results.

Presented "A disturbance-based ecosystem approach to maintaining and restoring freshwater habitat for anadromous salmonids." *In* proceedings of American Fisheries Society Meeting, Monterey, CA.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

None.

8. *Estimated Cost*:

	PNW
FY 94	24,000

9. *Duration of the Study*:

Initiation Date:	FY 90
Scheduled Completion Date:	FY 94

October 1994

Fundamental COPE
Annual Report

1. *Title*:

Behavior of Debris Torrents and Effects on Anadromous Fish Habitat in the Oregon Coast Range

2. *Principal Investigator(s) and Organization(s)*:

Dr. Fred H. Everest, Research Fish Biologist, Pacific Northwest Research Station, Corvallis
Dr. Lee E. Benda, Graduate Student/Staff, Department of Geological Sciences and Fishery Research Institute, University of Washington, Seattle, Washington
Dr. Gordon H. Reeves, Research Fish Biologist, Pacific Northwest Research Station, Corvallis
Dr. James R. Sedell, Research Ecologist, Pacific Northwest Research Station, Corvallis

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Identify and explain the effects of various riparian and stream conditions on fish populations and communities.

b. Identify and explain how various management practices in streams and riparian areas affect fish populations and communities and water quality.

c. Develop, refine, and test systems for predicting and reducing landslides, surface erosion, and sediment delivery to stream channels.

4. *Study Objective(s)*:

a. Determine the cause, frequency, behavior, and spatial and temporal distribution of debris torrents in sandstone and basalt geologies of the Oregon Coast Range.

b. Determine the spatial and temporal effects of debris flows on the physical structure of habitat for anadromous salmonids in streams draining sandstone and basalt geologies of the Oregon Coast Range.

5. *Potential Benefit or Utility of the Study*:

Though mass wasting by debris torrents is a natural process, forest management is altering the frequency and magnitude of these events across regional landscapes in the Pacific Northwest. The problem of assessing the effects of mass wasting on channel morphology and fish habitats on scales of watersheds and over time periods of decades has never been adequately investigated, yet it is an area of great importance to resource managers.

Information on how different frequencies and magnitudes of debris torrents affect channel morphology and fish habitat will enhance the manager's ability to solve such forest management problems as identifying geomorphically-driven biological thresholds in streams, defining the degree of heterogeneity of channel morphology needed to maintain biological diversity, and designing a methodology for analysis of cumulative effects.

6. *Research Activities*:

a. Accomplishments in FY 94:

Completed data analysis.

Examined the link between distribution of juvenile anadromous salmonids in stream sub-basins and physical habitat changes caused by debris torrents.

b. Problems Encountered in Meeting Research Obligations for FY 94:

None.

c. Planned for FY 95:

Complete a draft manuscript.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

Completed unpublished report on sources of wood in Cummins Creek.

Participated in field trips, seminars, and workshops as appropriate.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

None.

c. Planned for FY 95:

Participate in field trips, seminars, and workshops as appropriate.

Complete publication of the study results.

8. *Estimated Cost*:

	PNW
FY 94	24,000
FY 95	25,000

9. *Duration of the Study*:

Initiation Date:	FY 90
Scheduled Completion Date:	FY 95

October 1994

Fundamental COPE
Annual Report

1. *Title*:

Estimation of Smolt Production from Lobster Creek Study Basin

2. *Principal Investigator(s) and Organization(s)*:

Dr. Fred H. Everest, Research Fish Biologist, Pacific Northwest Research Station, Corvallis
Dr. Stanley V. Gregory, Associate Professor, Department of Fish and Wildlife, OSU, Corvallis
Dr. Gordon H. Reeves, Research Fish Biologist, Pacific Northwest Research Station, Corvallis
Dr. James R. Sedell, Research Ecologist, Pacific Northwest Research Station, Corvallis

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Identify and explain the effects of various riparian and stream conditions on fish populations and communities.

b. Identify and explain how various management practices in streams and riparian areas affect fish populations and communities and water quality.

4. *Study Objective(s)*:

a. Quantify salmonid smolt (juvenile migrants physiologically adapted for ocean existence) production from the Lobster Creek basin, including numbers, size, community structure, and timing of migration.

b. Relate production and behavior of smolts to land use activities in riparian and upland areas of the basin.

5. *Potential Benefit or Utility of the Study*:

Land management activities such as timber harvest and road construction can affect the physical configuration of stream habitats for anadromous salmonids. Changes in habitat can affect survival of young salmonids at various life history stages and result in ecological changes that favor one species over another. Changes in fish community structure are likely to follow if changes in habitat persist. While any life stage in the egg, embryo, alevin, fry, parr, smolt sequence can be affected by freshwater habitat changes, those changes that reduce smolt production are the most crucial to viability of a species.

To accurately assess the affects of land management practices on salmonid production in a stream subbasin, it is essential to quantify spatial and temporal changes in habitat and relate those changes to the number of smolts produced annually. The relationship between habitat and smolt production is not well documented for streams in the Oregon Coast Range. COPE basin studies offer the opportunity to couple land management, fish habitat, and salmonid smolt production in a way that will help to isolate the habitat factors that are most sensitive to change and are most likely to limit a given salmonid species.

6. *Research Activities*:

   a. Accomplishments in FY 94:

   None.

   b. Problems Encountered in Meeting Research Obligations for FY 94:

   Unforeseen equipment problems resulted in the poor recapture of marked fish. The resulting data made estimates of smolt numbers unreliable. Consequently, the study objectives could not be met.

7. *Publication and Technology Transfer Activities*:

   a. Completed in FY 94:

   Participated in field trips, seminars, and workshops as appropriate.

   b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

   Because of inadequate data, hypotheses could not be tested or meaningful results reported.

8. *Estimated Cost*:

	PNW
FY 94	19,000

9. *Duration of the Study*:

Initiation Date:	FY 90
Scheduled Completion Date:	FY 94

October 1994

Fundamental COPE
Annual Report

1. *Title*:

Ecology and Habitat Relationships of Selected Riparian-Associated Wildlife

2. *Principal Investigators and Organizations*:

Dr. Robert G. Anthony, Acting Leader, Oregon Cooperative Wildlife Research Unit, National Biological Survey, Department of Fisheries and Wildlife, OSU, Corvallis
Dr. William C. McComb, Professor, Departments of Forest Science and Fisheries and Wildlife, OSU, Corvallis

Advisory Personnel:

Dr. Joseph J. Beatty, Director, Biology Program, Biology Department, OSU, Corvallis
Dr. Stanley V. Gregory, Associate Professor, Department of Fisheries and Wildlife, OSU, Corvallis
Dr. David Hibbs, Associate Professor, Department of Forest Science, OSU, Corvallis
Dr. Thomas A. Spies, Research Forester, Pacific Northwest Research Station, Corvallis
Dr. John C. Tappeiner, Senior Research Forester, National Biological Survey, and Professor, Department of Forest Resources, College of Forestry, OSU, Corvallis

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Characterize wildlife communities in riparian and adjacent upland habitats and assess how changes in habitat affect wildlife species.

b. Develop silvicultural systems to maintain and improve fish and wildlife habitats in riparian areas and increase conifer development there.

4. *Study Objectives*:

a. Describe habitat relationships of selected riparian-associated wildlife.

b. Describe diets and reproductive fitness of selected riparian-associated wildlife.

c. Identify the important resources (food, water, habitat) that explain association to riparian areas.

5. *Potential Benefit or Utility of the Study*:

Riparian zone management is increasingly scrutinized by State and Federal agencies and the public, and associated wildlife are one of the important resources in these management considerations. Research is now underway to identify species of vertebrates that are closely associated with riparian areas, but no information is available on the extent of these associations nor the riparian resources which constitute any dependencies. Recent controversies over the new Forest Practices Rules and the lack of ecological information on riparian-associated wildlife makes the need for this information a high priority. This study will provide a data base upon which wildlife/forest management in riparian zones can be improved. Specifically, the study will identify the area and key resources (food, water, microhabitats, etc.) important to selected species (e.g., river otter, beaver, mink, marsh shrew, great-blue heron, bald eagles, kingfishers, etc.) that could be sensitive to riparian management. We will work closely with other COPE scientists to develop information for enhanced integrated resource management in riparian areas.

6. *Research Activities*:

a. Accomplishments in FY 94:

Intensive field work was conducted on dippers and to some extent on kingfishers and great blue herons.

Conducted data analysis and initiation of additional studies on white-footed voles.

b. Problems Encountered in Meeting Research Obligations for FY 94:

None.

c. Planned for FY 95:

Intensive field work on additional species, specifically white-footed voles.

d. Tasks to be Completed by Fiscal Year Starting in FY 96:

Prepare manuscripts for publication.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

Participated in field trips, seminars, and workshops as appropriate.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

None.

c. Planned for FY 95:

Present papers at scientific meetings.

Prepare manuscripts for publication.

Completion of Ph.D. dissertation.

8. *Estimated Cost*:

	OSU
FY 94	48,000
FY 95	50,000
FY 96	52,000

9. *Duration of the Study*:

Initiation Date:	FY 91
Scheduled Completion Date:	FY 96

October 1994

Fundamental COPE
Annual Report

1. *Title*:

The Utilization of Unconstrained Stream Reaches by Salmonids in the Oregon Coast Range

2. *Principal Investigators and Organizations*:

Dr. Gordon H. Reeves, Research Fish Biologist, Pacific Northwest Research Station, Corvallis

Dr. James R. Sedell, Research Ecologist, Pacific Northwest Research Station, Corvallis

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Identify and explain the effects of various riparian and stream conditions on fish populations and communities.

b. Identify and explain how various management practices in streams and riparian areas affect fish populations and communities and water quality.

4. *Study Objective(s)*:

Synthesize data from the Oregon Coast Range which encompasses channel reach types. Specifically the proportion of broad valley flats and their relative utilization by salmonids.

5. *Potential Benefit or Utility of the Study*:

Unconstrained reaches on wide valley flats have been shown in previous COPE research to be extremely productive and important refuges for different species and age classes of salmonids. Many stream habitat surveys and fish population estimates have been undertaken by several agencies in the last few years or are currently underway. No attempt has been made to examine this data from the point of view of fish species, age class and location in the basin of unconstrained reaches. A synthesis of this data would allow us to determine how much the Elk River case study can be extrapolated to other geologies and latitudes in the Oregon Coast Range. If the results hold up, the product of the research would be to aid managers in identifying high priority areas for fish habitat restoration.

6. *Research Activities*:

   a. Accomplishments in FY 94:

      All data entered into data base.

      Completed data analysis and synthesis.

      Unconstrained reaches of the upper part of Elk River contained a higher estimated density and diversity of fish than do unconstrained reaches. All anadromous fish found in the basin, coho and chinook salmon and steelhead and cutthroat trout, are found in unconstrained areas. In contrast, trout are the most abundant fish observed in constrained reaches. This pattern of distribution and abundance has been observed fairly consistently throughout the study.

   b. Problems Encountered in Meeting Research Obligations for FY 94:

      None.

   c. Planned for FY 95:

      Complete a draft manuscript that summarizes study results.

7. *Publication and Technology Transfer Activities*:

   a. Completed in FY 94:

      Presentation at Waikato University, Dept. of Biological Sciences, New Zealand.

      Participated in field trips, seminars, and workshops as appropriate.

   b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

      None.

   c. Planned for FY 95:

      Draft manuscript preparation.

8. *Estimated Cost*:

	PNW
FY 94	9,000
FY 95	10,000

9. *Duration of Study*:

Initiation Date:	FY 92
Scheduled Completion Date:	FY 95

October 1994

Fundamental COPE
Annual Report

1. *Title*:

Evaluation of Anadromous Salmonid Habitat Restoration Program on Schooner Creek, Hebo Ranger District, Siuslaw National Forest

2. *Principal Investigators and Organizations*:

Dr. James R. Sedell, Research Ecologist, Pacific Northwest Research Station, Corvallis
Dr. Gordon H. Reeves, Research Fish Biologist, Pacific Northwest Research Station, Corvallis
Mr. Robert Metzger, Siuslaw National Forest, Corvallis
The Northwest Steelheaders, Lincoln City Chapter, Lincoln City

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Identify and explain the effects of various riparian and stream conditions on fish populations and communities.

b. Identify and explain how various management practices in streams and riparian areas affect fish populations and communities and water quality.

4. *Study Objective(s)*:

a. Document and quantify physical changes in summer and winter habitats for steelhead trout, coastal cutthroat trout, coho salmon, and chinook salmon resulting from habitat rehabilitation in the South Fork of Schooner Creek.

b. Quantify response of juvenile anadromous salmonids to changes in summer and winter habitat.

c. Quantify changes in smolt production resulting from habitat rehabilitation.

d. Quantify numbers and species of adult salmonids returning to the South Fork of Schooner Creek.

e. Evaluate the cost-effectiveness of the overall rehabilitation program.

5. *Potential Benefit or Utility of the Study*:

The Siuslaw National Forest and the Oregon Department of Fish and Wildlife are engaged in a systematic program to restore and enhance habitats of anadromous salmonids in streams in the Oregon Coast Range including the South Fork of Schooner Creek. The Oregon Department of Fish and Wildlife and PNW Research Station are actively engaged in a systematic effort to evaluate the results of salmonid habitat rehabilitation programs in coastal Oregon. The Northwest Steelheaders are interested in restoration of steelhead stocks to provide improved angling opportunities. The COPE program is actively involved in research and education programs to maintain and enhance the productivity on Oregon's Coast Range resources.

The methods and techniques for habitat restoration are still in the developmental stage, and the physical, biological, and economic benefits of habitat restoration and enhancement are not completely understood. The accessibility and uniqueness of the Schooner Creek evaluation project have considerable educational and demonstration value to resource managers and the public in regard to the design and relative effectiveness of various fisheries habitat restoration and enhancement activities.

6. *Research Activities*:

a. Accomplishments in FY 94:

Continued monitoring of smolts leaving basin.

Collected data for objectives a. - d.

b. Problems Encountered in Meeting Research Obligations for FY 94:

None.

c. Planned for FY 95:

Complete smolt trapping.

Complete habitat/fish quantification.

Complete riparian vegetation inventory.

d. Tasks to be Completed by Fiscal Year Starting in FY 96:

FY 1996
Complete data analysis, make estimates of cost-effectiveness and prepare a draft publication summarizing study results.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

Participated in field trip for mid-term COPE symposium "The Ecology and Management of Oregon Coast Range Forests.

Participated in field trips, seminars, and workshops as appropriate.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

None.

c. Planned for FY 95:

Participate in field trips, seminars, and workshops as appropriate.

8. *Estimated Cost*:

	PNW
FY 94	48,000
FY 95	50,000
FY 96	53,000

9. *Duration of the Study:*

Initiation Date:	FY 92
Scheduled Completion Date:	FY 96

October 1994

Fundamental COPE
Annual Report

1. *Title*:

Strength Behavior of Forest Soils Under True Field Stresses

2. *Investigators and Organizations*:

Dr. J. Richard Bell, Professor Emeritus, Department of Civil Engineering, OSU, Corvallis (Principal Investigator)

Dr. Marvin R. Pyles, Associate Professor, Department of Forest Engineering, OSU, Corvallis (Associate Investigator)

Dr. Warren L. Schroeder, Chief Business Officer, OSU, Corvallis (Study Consultant)

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Develop, refine, and test systems for predicting and reducing landslides, surface erosion and sediment delivery to stream channels.

4. *Study Objective(s)*:

a. Review published information on residual soils and soil strength theories and testing procedures especially as related to soils under low ambient stress levels.

b. Design and construct strength testing apparatus and procedures for low stress testing and stress path control.

c. Test laboratory prepared specimens under stress conditions that simulate actual stresses in steep forested or recently logged slopes.

d. Test typical natural soils to obtain a preliminary evaluation of the range and variability of the controlling strength parameters.

e. Document the equipment, procedures, and results and present results at COPE workshops and appropriate conferences.

5. *Potential Benefit or Utility of the Study*:

In recent years there has been a major effort to apply the theories of soil mechanics to the problem of shallow landslides on the steep forested slopes of the Pacific Northwest. Even though these techniques have been successful in civil engineering applications their application to forested slopes has been disappointing. Since the methods of analysis often have been proven elsewhere, it is believed the difficulty is with the input data - especially soil strength data.

For most civil engineering works the ambient stresses in the soils are relatively higher than in the forested slopes. Also, engineering construction usually increases total stresses. In the forest soil slope, failures are usually the result of reductions of effective stress at essentially constant total stress. Standard test equipment and procedures are designed for the civil engineering applications and nearly all information in the literature is based on research with this equipment.

Tests at higher stresses may overwhelm and thereby obscure the factors that control behavior at low stresses. Some low stress tests have been performed by forest engineering researchers at OSU, but they were performed with increasing total stress loading and they leave many questions unanswered. It is the purpose of this study to conduct a detailed laboratory study of typical forest soils subjected to stress paths (loading conditions) true to those developed in the steep forested slopes of the Pacific Northwest.

6. *Research Activities*:

a. Accomplishments in FY 94:

Completed the literature review and tabulation of published strength test results.

Performed CRS tests on recompacted forest soil specimens to investigate the effects of stress level.

Designed, constructed, and tested equipment and procedures for stress controlled (CS) triaxial strength testing.

Began preparation of a draft of the CRS and CS testing manual.

Performed CS tests on recompacted forest soil specimens to compare to CRS test results.

Identified field sampling sites and began undisturbed specimen CRS and CS testing.

b. Problems Encountered in Meeting Research Obligations for FY 94:

The equipment construction and preliminary soils testing required more tests than planned, therefore, required more time than budgeted.

c. Planned for FY 95:

Complete undisturbed tests and documentation and prepare publications.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

Drafts of two theses reporting literature review of forested soil strength values, CRS and FSP equipment and procedures, and results of recompacted specimen testing.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

All equipment construction and testing CRS completed but extra tests delayed report preparations and only drafts, rather than final theses were completed.

c. Planned for FY 95:

Thesis reporting review of forested soil strength values, constant rate of strain (CRS) strength test equipment and procedures, and results of CRS tests on recompacted soil specimens.

Thesis reporting field stress path (FSP) strength test equipment and procedures and results of FSP tests on recompacted soil specimens.

Thesis reporting undisturbed CRS and CS tests results.

Final draft of CRS and FSP testing manual.

8. *Estimated Cost*:

	OSU
FY 94	35,000
FY 95	37,000

9. *Duration of the Study*:

Initiation Date:	FY 92
Scheduled Completion Date:	FY 95

October 1994

Fundamental COPE
Annual Report

1. *Title*:

Integrating and Managing Recreation with Other Resources

2. *Principal Investigators and Organizations*:

Dr. Perry J. Brown, Professor, Department of Forest Resources, OSU, Corvallis
Dr. George H. Stankey, Senior Research Professor, Department of Forest Resources, OSU, Corvallis
Dr. Roger Clark, Program Manager, Pacific Northwest Research Station, Seattle, Washington

The project is conducted within the structure of the Consortium on Social Values of Natural Resources, of which all three investigators are members of the Board of Directors.

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

This study encompasses both the riparian and reforestation management issues.

4. *Study Objective(s)*:

   a. Determine what is known about management of recreation relative to sustainability and to other resource uses.

   b. Develop a conceptual framework for understanding how recreation can be integrated with other resource uses.

   c. Develop guidelines for management of recreation which is integrated with other resource uses and which considers resource sustainability.

5. *Potential Benefit or Utility of the Study*:

Resource management often has been divided into functional areas which pit one resource use against another and which lead to competition among managers of different resource functions. We now are moving into an era where recognition of the complementary relationship among many resource uses is recognized and valued. Simply, in many cases joint production of resource outputs is possible and desirable. Some forms of recreation, timber, wildlife, and grazing management (and outputs) particularly fit this situation. Additionally, a recognition of the need to ensure sustainability of resources is a major tenet of the current resource management paradigm. What this suggests is that we need to find ways to do joint production while ensuring resource sustainability. Specifically, we need to synthesize what we know about integrating recreation with other resource uses, particularly timber and wildlife, and develop guidelines for integrating recreation with these other resource uses.

This study will involve developing a conceptual framework for considering recreation in integrated resource management. It will involve synthesizing what we now know about joint production which includes recreation and it will involve developing guidelines for recreation management in an integrated and sustainable resource management system. Thus, it will provide much needed information about how to manage the recreation resources of Oregon's coastal forests such that resources can be sustained and multiple social values served.

6. *Research Activities*:

a. Accomplishments in FY 94:

A conceptual framework using a list of principles of integrated resource management (sustainable ecosystem management) has been developed and research results and management demonstrations have been fit into this framework.

Completed formulation of management guidelines (objective c).

b. Problems Encountered in Meeting Research Obligations for FY 94:

Scheduling a final review meeting with the managers advisory group has been difficult, so the final report is still in preparation. Thus, the project has been extended through FY 95.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

Hospodarsky, D. Recreation: Another product for forest enhancement research. Poster presented at "The Ecology and Management of the Oregon Coast Range Forests": A mid-term COPE symposium. Gleneden Beach, Oregon. March 29-30, 1994.

Participated in workshops, seminars, and field trips as appropriate.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

See 6.b.

8. *Estimated Cost*:

	OSU
FY 94	29,000
FY 95	0

9. *Duration of the Study:*

Initiation Date: FY 92
Scheduled Completion Date: FY 94

October 1994

Fundamental COPE
Annual Report

1. *Title*:

Harvesting Alternatives in Upland and Riparian Areas in the Oregon Coast Range

2. *Principal Investigators and Organizations*:

Dr. Loren D. Kellogg, Associate Professor, Department of Forest Engineering, OSU, Corvallis

This study is conducted in cooperation with and in support of two Adaptive COPE studies: (1) Integrated Responses of Multiple Forest Resources to Active Management in Riparian Zones in the Oregon Coast Range and (2) Commercial Thinning and Underplanting to Enhance Structural Diversity of Young Douglas-fir Stands in the Oregon Coast Range.

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Test and compare harvesting systems that enable managers to achieve various states of fish and wildlife habitat and levels of timber production in riparian areas.

4. *Study Objective(s)*:

a. Identify the logging planning, layout, and operational requirements to carry out prescribed active riparian management and stream enhancement activities.

b. Determine logging production and cost for removing hardwood trees in small openings in the riparian management area (length = 300 ft. along stream; width = RMA designed width).

c. Determine logging costs for placing woody debris in riparian management areas during the harvest operation.

d. Determine skyline commercial thinning cost and profit for three levels of stand density management to enhance structural diversity of young forests (residual stand densities = 100 tpa, 60 tpa, and 30 tpa).

5. *Potential Benefit or Utility of the Study*:

It is important that forest operations are adequately considered when evaluating response of multiple forest resources to alternative silviculture prescriptions. There are many logging constraints associated with steep terrain and cable operations in the Oregon Coast Range. Nontraditional silvicultural prescriptions must be evaluated for feasibility and cost. In addition, worker safety is an area of concern by the timber industry. For a complete identification and evaluation of these prescriptions, information needs to be obtained and presented concerning operational logging issues as well as other multiple forest resource issues.

Both the riparian management study and the upslope commercial thinning study will provide key information to forest managers interested in managing stands with increased structural diversity. Linkage with the harvesting study in these two areas will contribute to a wider base of information and provide answers to operational questions on logging planning, economics, and worker safety.

6. *Research Activities*:

a. Accomplishments in FY 94:

The following riparian logging studies were completed for replication one and two:

- felling and yarding in riparian openings
- large debris installation with a skyline system
- large debris installation with log loader equipment

Skyline thinning studies were completed for two replications at three thinning levels (residual stand densities of 100 tpa, 60 tpa and 30 tpa) utilizing a TMY 40 yarder with a mechanical slackpulling carriage and a Koller 501 yarding with a manual slackpulling carriage.

Preliminary riparian logging study results indicate that stream enhancement can take place during logging operations using skyline yarding equipment and be cost effective if well planned and executed. The timber value and operation costs on two replications ranged from $656 to $1,296 (timber value) and $856 to $2,420 (operation costs).

Continued harvesting studies on riparian operations and commercial thinning.

b. Problems Encountered in Meeting Research Obligations for FY 94:

None.

c. Planned in FY 95:

Finish harvesting studies.

Data analysis and reporting of results.

7. *Publication and Technology Transfer Activities:*

a. Completed in FY 94:

Skaugset, A., L. Kellogg, S. Pilkerton, and M. Miller. 1994. Active riparian zone management: The clearcut approach, preliminary logging operations research results. COPE Report 7(1):2-4.

Skaugset, A., L. Kellogg, S. Pilkerton, and M. Miller. 1993. Active riparian management project summary. In: Field Tour Notebook, Oregon and Washington Silviculture Tour, Western Forestry and Conservation Association. October 13-14, 1993.

Skaugset, A., E. Dent, D. Bateman, M. Newton, J. Walsh, E. Cole, L. Kellogg, S. Pilkerton, M. Miller, and B. Stringham. Active riparian management: Effects on forest resources. Poster display at "The Ecology & Management of Oregon Coast Range Forests": A Mid-term COPE Symposium. Gleneden Beach, Oregon. March 29-31, 1994.

Skaugset, A., E. Dent, D. Bateman, M. Newton, J. Walsh, E. Cole, L. Kellogg, S. Pilkerton, M. Miller, and B. Stringham. Active riparian management: Effects on forest resources. Poster display at "Advanced Technology in Forest Operations: Applied Ecology in Action." Portland & Corvallis, Oregon. July 24-29, 1994.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

None.

c. Planned for FY 95:

Publication on thinning research.

Publication on riparian harvesting research.

Presentation at COPE riparian harvesting workshop.

8. *Estimated Cost*:

	OSU
FY 94	68,000
FY 95	70,000

9. *Duration of Study*:

Initiation Date:	FY 92
Scheduled Completion Date:	FY 95

October 1994

Fundamental COPE
Annual Report

1. *Title*:

Economic Analysis of Forest Management--Fisheries Interactions

2. *Principal Investigators and Organizations*:

Susan J. Alexander, Research Forester, Pacific Northwest Research Station, Corvallis

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6):*

Riparian Zone Management

Develop economic models capable of assessing the economic impacts of various management regimes in riparian zones, and apply them to conditions prevailing on the Oregon Coast.

4. *Study Objective(s):*

Assess the economic impacts of forestry on fisheries, using existing models of forest-fish interactions. Resource values will be calculated, and the value of two management options on the Elk River, southwest Oregon will be compared and discussed.

5. *Potential Benefit or Utility of Study*:

The interaction of forest management and fisheries is a topic being debated as forest planners have come to realize that management activities have many diverse and significant effects on non-timber resources. Translating management activities into economic gains or losses for salmon and steelhead fishing has been attempted many times. The attempts are often inadequate on two grounds: first, the lack of models relating forest practices to fish habitat means that the all-or-nothing studies contain no incremental analysis, and second, economic analyses fail to provide values consistent with consumer theory. A study that addresses the poorly understood economic effects of forest management on fisheries will help the debate underway in the Pacific Northwest to attain a conclusion based on sound scientific principles.

6. *Research Activities*:

a. Accomplishments in FY 94:

Continued development of theoretical model to value anadromous fish. Continued assessment of state and federal data sets for applications to non-market valuation techniques.

Completed model to determine management activity impacts on fish stocks.

Completed value assessments generated by different theories of valuation and equity.

b. Problems Encountered in Meeting Research Obligations for FY 94:

None.

c. Planned for FY 95:

Manuscript completion and scientific exchange.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

Publication of poster abstract and presentation of poster "Models and valuation of forest management and anadromous fish" at a mid-term COPE symposium "The Ecology and Management of Oregon Coast Range Forests." Gleneden Beach, Oregon. March 29-30, 1994.

Began preparing a draft dissertation.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

None.

c. Planned for FY 95:

Prepare final publications, Ph.D. dissertation.

Prepare a **COPE Report** article.

8. *Estimated Cost*:

	PNW
FY 94	79,000
FY 95	24,000

9. *Duration of Study*:

Initiation Date:	FY 93
Scheduled Completion Date:	FY 95

October 1994

Fundamental COPE
Annual Report

1. *Title*:

Management Policies for Increasing Recreation's Contributions to the Economies of Oregon Coast Range Communities

2. *Principal Investigators and Organizations*:

Dr. Rebecca L. Johnson, Associate Professor, Department of Forest Resources, OSU, Corvallis

Mr. Kreg Lindberg, Graduate Research Assistant, Department of Forest Resources, OSU, Corvallis

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

This study encompasses both the riparian and reforestation management issues.

4. *Study Objective(s)*:

a. Determine what is currently known about the economic, social, and ecological impacts of recreation/tourism in Oregon Coast Range counties.

b. Identify economic development goals and criteria for economic stability.

c. Identify and estimate tourism's economic impacts in coastal counties, and their relationship to development goals. Develop a model for tourism management based on integration of economic, social, and ecologic impacts.

d. Investigate relationships between forest management activities, level of demand for recreation, and resulting economic impact in Coast Range counties. When possible, quantify these relationships.

e. Evaluate and present management options for increasing tourism's contribution to Oregon Coast Range economies.

5. *Potential Benefit or Utility of Study*:

Oregon Coast Range counties are currently undergoing a significant transition as the recreation/tourism industry is developed in an effort to diversify local and regional economies.

While tourism already fills an important position in these economies, the long-term stability of this industry requires that future planning and management be based on knowledge of tourism's role in meeting economic goals, as well as knowledge of its social and ecologic impacts. Tourism's stability also depends critically on the management of the forestry sector since forest management practices directly and indirectly affect the tourism product.

Many coastal residents have become disappointed because tourism has not generated levels of income equivalent to the wood products industry, for which tourism has often been viewed as a replacement. Therefore, the first component of this project will involve estimating the current economic impact of tourism in Oregon Coast Range counties, with particular attention given to the nature of tourism employment (seasonality, wage level, etc.) and how such employment fits into economic goals. Opportunities for enhancing tourism's economic contribution will be identified. Tourism's economic impact will also be evaluated over time to identify likely future trends.

In addition, county governments and local communities increasingly recognize that tourism development can generate social and ecologic impacts. These impacts need to be incorporated into planning and management to ensure long-term economic stability. For example, negative social impacts in Cannon Beach and Seaside have led to restrictions on vacation rentals, and thus a reduction in economic benefits. This study will identify social and ecologic impacts and integrate them with economic impacts into a model for determining how tourism can be planned and managed to generate the greatest economic benefits with the fewest social and ecologic costs.

Furthermore, agencies responsible for managing Oregon Coast Range forests realize that management practices have an effect on the quality of the recreation experience, and thus tourism's impact on local economies. Therefore, this project will investigate this relationship and identify forest management practices which contribute to the enhancement of a healthy tourism economy.

This project will lead to a better understanding of tourism's current and potential role in diversifying Oregon Coast Range economies, a better understanding of how to manage tourism to enhance economic stability, and a better understanding of how forest management practices affect tourism's economic contribution to coastal counties.

6. *Research Activities*:

   a. Accomplishments in FY 94:

   Completed survey of residents to identify concerns, goals and social impact of tourism.

   Identified, estimated and modeled tourism impacts (objective c). Presented recommended management options (objective e).

   The results of the project show that coastal residents generally feel that the benefits of recreation and tourism in their communities outweigh the costs. However, they would like to see recreation and tourism spread out more, both temporally and geographically. They are also willing to pay for solutions to recreation/tourism problems, such as congestion, noise and crime, and low-income housing.

b. Problems Encountered in Meeting Research Obligations for FY 94:

None.

7. *Publication and Technology Transfer Activities:*

a. Completed in FY 94:

Presented paper on "Management policies for increasing recreation's contribution to the Economies of Oregon coast range communities." The Ecology and Management of Oregon Coast Range Forests: A mid-term COPE Symposium. Gleneden Beach, Oregon. March 30, 1994.

Lindberg, K., R. Johnson, and B. Rettig. 1994. Attitudes, concerns, and priorities of Oregon coast residents regarding tourism and economic development. Oregon Sea Grant. Corvallis, OR. (in press)

"Evaluating the social impacts of tourism development and economic transition." Fifth International Symposium and Resource Management. Fort Collins, Colorado. June 1994.

"Evaluating and managing the social impacts of tourism in coastal areas." Pacific Congress on Marine Science and Technology (PACON). Townsville, Australia. July, 1994.

"Economic valuation of the social impacts of coastal tourism development." Conference on the Environment & People of the Coastal Temperate Rain Forest. Whistler, British Columbia. August 1994.

"Tourism's contribution to rural Oregon coast (USA) communities." Second Global Conference: Building a Sustainable World through Tourism. Montreal, Canada. September 1994.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

None.

8. *Estimated Cost:*

	OSU
FY 94	21,000

9. *Duration of Study:*

Initiation Date:	FY 93
Scheduled Completion Date:	FY 94

October 1994

Fundamental COPE
Annual Report

1. *Title*:

Ecology and Management of Shrubs and Hardwoods in Coastal Forests

2. *Principal Investigator(s) and Organization(s)*:

Dr. John C. Tappeiner, Senior Research Forester, National Biological Survey, and Professor, Department of Forest Resources, College of Forestry, OSU, Corvallis
Dr. John C. Zasada, Research Forester, Pacific Northwest Research Station, Corvallis
Dr. Steven R. Radosevich, Professor, Department of Forest Science, College of Forestry, OSU, Corvallis
Mr. Samuel Chan, Plant Physiologist, Pacific Northwest Research Station, Corvallis

This work will be coordinated with riparian zone studies.

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Reforestation in the Oregon Coast Range

a. Develop and test strategies for reforestation that will be effective wherever coastal forests grow, even with constraints on prescribed fire and herbicides.

b. Examine the economics of the above-mentioned strategies and assess the economic impacts of constraints on fire and herbicides.

4. *Study Objective(s)*:

Develop guidelines and techniques for managing the major shrub and hardwood species in the forests of coastal Oregon by:

a. Relating their potential rates of vegetative reproduction to the size and vigor of their aerial and/or underground parts;

b. Determining the effect of common silvicultural treatments (logging, burning, cutting) on vigor and density of vegetation reproduction;

c. Determining their rates of reproduction and growth from seed and sprouts in a range of environments common in clearcuts and in young and old stands.

5. *Potential Benefit or Utility of the Study:*

Currently, foresters manage nonconiferous vegetation in the Coast Range to enhance conifer growth and to provide wildlife habitat. However, they do so with little information on the reproduction and growth habits of shrubs and hardwoods. At what stage of succession do shrubs and hardwoods become established? What environments favor their establishment, and what are their growth rates following reproduction from seed, from vegetative reproduction, and following burning and other silvicultural treatments? How can establishment and growth be predicted? At what age and in what environments do they produce seed? How does interspecific competition affect succession and species composition? With answers to these questions, foresters will be better able to make site-specific prescriptions to produce wildlife habitat and to enhance conifer growth. Zasada and Tappeiner have begun seedling growth and survival studies on salal, bigleaf maple, vine maple, thimbleberry, and elderberry. Tappeiner has completed studies on vegetative and seedling reproduction of tanoak and madrone. Radosevich has begun studies on the seedling establishment and vegetative growth of thimbleberry and salmonberry. Maxwell and Radosevich have also begun development of population growth models for these species which includes the influence of intra- and inter-specific competition on demographic parameters and lateral spread from rhizomes. These models will provide a means of assessing the influence of management practices on salmonberry and thimbleberry. Thus collectively, with this research, we will be able to make a substantial step toward answering the questions posed for these major species.

6. *Research Activities*:

a. Accomplishments in FY 94:

Remeasured salmonberry plots.

Remeasured bigleaf maple sprouting study.

Installed shrub-hemlock regeneration study.

Continued data analysis of salmonberry persistence plots.

Examined effects of understory shrubs and logs on the forest floor on hemlock natural regeneration.

Continued to monitor salmonberry, salal persistence plots.

b. Problems Encountered in Meeting Research Obligations for FY 94:

None.

c. Planned for FY 95:

Data analysis and manuscript preparation.

Monitor salmonberry and salal persistence plots.

Monitor and remeasure shrub-hemlock regeneration study.

d. Tasks to be Completed by Fiscal Year Starting in FY 96:

FY 96
Complete monitoring of salmonberry and salal persistence study.

Complete monitoring of hemlock regeneration study.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

Huffman, David W., John C. Zasada, and John C. Tappeiner. 1994. Growth morphology of rhizome cuttings and seedlings of salal (*Gaultheria shallon*): effects of four light intensities. Canadian Journal of Botany. (accepted)

Huffman, D. W. Regeneration of shrubs and hardwoods in Coastal Oregon Forests. Poster presentation at "Ecology and Management of Oregon Coast Range Forests": A mid-term COPE Symposium. Gleneden Beach, Oregon. March 29-31, 1994.

Huffman, D. W., J. C. Tappeiner, and J. C. Zasada. 1994. Regeneration of salal in the central Coast Range Forests of Oregon. Canadian Journal of Botany 72:39-51.

O'Dea, M. E., J. C. Zasada, and J. C. Tappeiner. 1994. Vine maple clone growth and reproduction in managed and unmanaged coastal Oregon Douglas-fir forests. Ecological Applications. (in press)

Tappeiner, J. C., et al. Synthesis of shrub ecology and management. (draft)

Participated in field trips, seminars, and workshops, as appropriate.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

None.

c. Planned for FY 95:

Begin data analysis of salal and salmonberry persistence study.

Begin data analysis of effects of shrub and down logs on hemlock regeneration in coastal forests.

Prepare manuscript on bigleaf maple vegetative reproduction.

8. *Estimated Cost*:

	OSU	*PNW*	*TOTAL*
FY 94	39,000	24,000	63,000
FY 95	41,000	25,000	66,000
FY 96	0	0	0

9. *Duration of the Study*:

Initiation Date:	FY 87
Scheduled Completion Date:	FY 96

October 1994

Fundamental COPE
Annual Report

1. *Title*:

Second Decade Effects of Site Preparation on Tree and Vegetation Development With and Without Precommercial Thinning

2. *Principal Investigator(s) and Organization(s)*:

Dr. William I. Stein, Research Forester, Pacific Northwest Research Station, Corvallis
Dr. Peyton W. Owston, Team Leader, Pacific Northwest Research Station, Corvallis

3. Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6):

Reforestation in the Oregon Coast Range

a. Develop and test strategies for reforestation that will be effective wherever coastal forests grow, even with constraints on prescribed fire and herbicides.

b. Examine the economics of the above-mentioned strategies and assess the economic impacts of constraints on fire and herbicides.

c. Identify the effects of prescribed fire on long-term site productivity and develop methods to reduce adverse impacts.

4. *Study Objective(s)*:

Determine the extended effects of reforestation practices on the growth of trees and associated vegetation with or without precommercial thinning by:

a. Comparing tree survival and growth during the second decade following different site preparation treatments.

b. Determining changes in vegetative cover, height, and animal use as conifers close crowns with or without precommercial thinning.

c. Quantifying the effects of precommercial thinning on stand growth, vegetative development, and animal use.

5. *Potential Benefit or Utility of the Study*:

Substantial information is available on the short-term effects of different reforestation practices on survival and growth of conifers and the development of associated vegetation in coastal forests but very little on the duration of these effects as crowns close and intraspecific competition becomes a prominent factor. Precommercial thinning is also practiced extensively, but its effects on early growth in plantations and the development of associated vegetation has not been quantified. The scheduled duration of two studies in which site preparation treatments were compared side-by-side for a decade on the Siuslaw National Forest is just ending. Large differences are evident due to treatments and to tree protection by tubing.

It is important to learn whether these differences continue as stands close and what effect precommercial thinning has on both stand development and vegetation associated with each treatment. The one study, with 5 replications, is large enough to accommodate a thinning treatment within the framework of the original design. It represents one of the few opportunities to follow the effects of reforestation practices on a longer-term basis where both trees and associated vegetation are monitored to learn the interrelated effects of treatment on both timber and wildlife.

6. *Research Activities*:

a. Accomplishments in FY 94:

Remeasured vegetation transects on one study site.

Remeasured tree diameters and heights on one study site.

b. Problems Encountered in Meeting Research Obligations for FY 94:

None.

c. Planned for FY 95:

Remeasure vegetation transects on two of the study sites.

Remeasure tree diameters and heights on two of the study sites.

Work on data analysis.

d. Tasks to be Completed by Fiscal Year Starting in FY 96:

FY 1996
Remeasure vegetation transects on two of the study sites.

Remeasure tree diameters and heights on half of the study sites.

Complete data analysis.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

Stein, W. I. Ten-year survival and growth of planted Douglas-fir and western redcedar after seven site-preparation treatments. (draft)

Presented two posters at "The Ecology and Management of Oregon Coast Range Forests": A Mid-term COPE Symposium. Gleneden Beach, Oregon. March 29-30, 1994:

> Stein, W. I. The coastal reforestation systems study: An integrated comparison of alternatives.
>
> Stein W. I. Ten-year development of Douglas-fir and associated vegetation after different site preparation on Coast Range clearcuts.

Coastal site preparation study: 10 year results. 1993 Oregon & Washington Silviculture Council Field Tour. October 13-14, 1993.

Prepared for publication: Ten-year development of Douglas-fir and associated vegetation after different site preparation on Coast Range clearcuts.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

None.

c. Planned for FY 95:

Publication of manuscripts.

8. *Estimated Cost:*

	PNW
FY 94	41,000
FY 95	43,000
FY 96	45,000

9. *Duration of the Study*:

Initiation Date:	FY 89
Scheduled Completion Date:	FY 96

October 1994

Fundamental COPE
Annual Report

1. *Title*:

Species Manipulation as a Strategy to Reduce the Impact of Laminated Root Rot in Regenerated Coastal Stands

2. *Principal Investigator(s) and Organization(s)*:

Dr. Walter G. Thies, Research Plant Pathologist, Pacific Northwest Research Station, Corvallis

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6)*:

Reforestation in the Oregon Coast Range

a. Develop and test ways of reducing root rot damage in new plantations.

4. *Study Objective(s)*:

a. Identify the relative susceptibility of coastal Oregon conifers to laminated root rot.

b. Determine if the number of nonsymptomatic-diseased trees in a stand is correlated to the number of symptomatic trees.

c. Measure the minimum inoculum size that can cause seedling mortality.

d. Determine if the size and condition of stumps left on the site can be successfully used to predict seedling mortality due to laminated root rot in the regenerated stand.

5. *Potential Benefit or Utility of the Study*:

Laminated root rot is responsible for significant losses in the Oregon Coast Range. Using data from recently completed surveys by state and federal agencies we conservatively estimate that there are 300,000 acres of openings in the forests of the Oregon Coast Range caused by laminated root rot, with a nearly equal area populated by infected live trees. This is land out of production but it is also land on which up to $500 per acre is being spent for site preparation and planting which will not result in a harvestable stand. Losses are more severe in northern counties than in southern counties. Using the above survey data, we estimated that Columbia County is experiencing a 50 percent production short-fall on 32 percent of the commercial forest land.

Douglas-fir is very susceptible to laminated root rot yet it occupies large areas of commercial forests in the Oregon Coast Range. Use of valuable but more resistant conifers could increase economic yield on infested forest lands, with relatively little additional investment. However, at this time, a verified ranking of commercial conifer species by their susceptibility to laminated root rot is not available. Data on susceptibility to infection and yield of various species on infested sites is an essential prerequisite to recommending reforestation with alternate conifers on traditional Douglas-fir sites.

To develop an ability to predict laminated root rot losses in a replacement stand we need to determine the size of roots that can serve as effective inoculum and the frequency of nonsymptomatic infected trees in an uncut stand.

6. *Research Activities*:

a. Accomplishments in FY 94:

Collected and analyzed seedling mortality from inoculum rebury plots on Study Areas One, Two, and Three.

Performed plot maintenance on Study Areas One, Two, and Three.

Checked inoculum survival on Study Area Three.

Replanted Study Area Three as needed on plots over "undisturbed inoculum".

Planted seedlings over reburied inoculum pieces on Study Area Three.

Completed post cut survey on Study Area Four.

Moved slash piles left on the site.

Located and mapped in circular plots on Study Area Four.

b. Problems Encountered in Meeting Research Obligations for FY 94:

Slash piles were not moved until July which precluded the accomplishment of all the preparatory work needed to do root recovery and reburial. If possible, the root recovery and reburial will be rescheduled for FY 95.

c. Planned for FY 95:

Study Area One: Collect mortality data from both inoculum rebury plots and from undisturbed plots. Tag and map seedlings on undisturbed plots.

Study Area Two: Collect and analyze data from inoculum rebury plots.

Study Area Three: Plot maintenance.

Plant seedlings on circular plots, area four.

Study Area Four: Plot maintenance, replant as needed.

Check inoculum survival on Study Area Four.

d. Tasks to be Completed by Fiscal Year Starting in FY 96:

FY 1996
Study Area One: Collect mortality data from all plots.

Study Area Two: Collect mortality data on all plots. Tag and map seedlings on undisturbed plots.

Study Area Three: Collect and analyze data from inoculum rebury plots.

Study Area Four: Plot maintenance.

Prepare a manuscript reporting the correlation between symptomatic diseased trees and nonsymptomatic diseased trees.

Prepare a report on the relationship of residual infected stump size to mortality of nearby seedlings due to laminated root rot.

Final reports: Summary paper of species susceptibility information based on inoculum-rebury plots in Study Area One, Two, and Three.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

Thies, W. G. Do you dig roots? Southern Station chemical sciences meeting. Starkville, Mississippi. February 1-2, 1994.

Thies, W. G. Fumigant application to reduce inoculum of laminated root rot: From stumps to living trees. Southern Station chemical sciences meeting. Starkville, Mississippi. February 1-2, 1994.

Thies, W. G. Studies of laminated root rot in the Oregon Coast Range. N. W. Oregon Forest Protective Association. April 6, 1994.

Thies, W. G. Manipulating species as a strategy for mitigating effects of laminated root rot in regenerated coastal stands: Study installation. Poster presented at:

Western International Forest Disease Work Conference. Albuquerque, New Mexico. March 7-10, 1994.

The Ecology and Management of Oregon Coast Range Forests: A mid-term COPE symposium. Gleneden Beach, Oregon. March 29-31, 1994.

Harrington, C., and W. G. Thies. Use of invasive treatments to control laminated root rot in living Douglas-fir: Effects on tree growth and survival. Poster presented at:

Western International Forest Disease Work Conference. Albuquerque, New Mexico. March 7-10, 1994.

Southern Station chemical sciences meeting. Starkville, Mississippi. February 1-2, 1994.

The Ecology and Management of Oregon Coast Range Forests: A mid-term COPE symposium. Gleneden Beach, Oregon. March 29-31, 1994.

Thies, W.G. and P. A. Cunningham. 199X. Estimating large root biomass from stump and breast height diameter for Douglas-fir in Western Oregon. (submitted to Canadian Journal Forestry Research)

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

None.

c. Planned for FY 95:

Draft at least one paper relating to the inoculum distribution in infested stands.

8. *Estimated Cost*:

	PNW
FY 94	108,000
FY 95	116,000
FY 96	92,000

9. *Duration of the Study*:

Initiation Date:	FY 89
Scheduled Completion Date:	FY 96

October 1994

Fundamental COPE
Annual Report

1. *Title*:

Characterization of Trichoderma spp.: Prelude to Biological Control

2. *Principal Investigator(s) and Organization(s)*:

Dr. Earl E. Nelson, Research Plant Pathologist, Pacific Northwest Research Station, Corvallis

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6)*:

Reforestation in the Oregon Coast Range

a. Develop and test ways of reducing root rot damage in new plantations.

4. *Study Objective(s)*:

a. Collect and identify Trichoderma spp. associated with root pathogens.

b. Characterize isolates using isozyme analyses and related technology.

c. Test promising isolates for biological control potential.

5. *Potential Benefit or Utility of the Study*:

Laminated root rot (Phellinus weirii) and other root diseases of western conifers greatly reduce yields on many thousands of acres in western Oregon. Annual loss to P. weirii alone in western United States has been estimated at 4.4 million cubic meters of timber. Root diseases not only reduce tree growth and cause mortality, but keep valuable forest lands out of production by their continued presence as facultative saprophytes in roots and butts of killed or harvested trees. Consequently, regeneration of these areas to Douglas-fir or other susceptible conifers is doomed to failure, unless these pathogens are removed from the site or effectively eliminated by chemical or biological controls.

Inoculations with isolates of Trichoderma spp. into stumps infested with P. weirii have resulted in colonization by those inoculants, and have presumably reduced the viability of the pathogen in those parts of the stumps colonized. Tests of antagonism of Trichoderma spp. against Armillaria luteobubalina (Nelson et al. 1989) appear to work equally well with Trichoderma spp. against P. weirii, but these tests, using colonized stem wood sections, are time consuming. Isozyme analysis of isolates of Trichoderma spp. appears to be a useful means of characterizing specific isolates as an aid in taxonomic classification, and perhaps as a means of "finger printing" specific isolates. In addition, this and other techniques can be used to probe for specific attributes pointing toward effective biological control or competitive colonization of pathogen-infested substrates.

6. *Research Activities*:

a. Accomplishments in FY 94:

Identified 781 isolates of Trichoderma spp. from roots of Douglas-fir trees, and placed in permanent storage for future testing. Trichoderma viride accounted for 73% of all isolates. Trichoderma spp. were more often found in roots of fumigated trees than untreated controls, and may in part account for reduced presence of Phellinus weirii.

Completed isozyme studies and began final series of antagonism tests.

b. Problems Encountered in Meeting Research Obligations for FY 94:

Not all isozyme runs have been completed due to other obligations of isozyme technician and large demand for isozyme facilities.

c. Task to be Completed in FY 95:

Complete isozyme runs and antagonism testing.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

Nelson, E. E., W. G. Thies, and M. G. McWilliams. Trichoderma spp. from roots of fumigated Douglas-fir trees infected with Phellinus weirii. (submitted to European Journal of Forest Pathology)

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

None.

c. Planned for FY 95:

Prepare a draft report summarizing study results.

8. *Estimated Cost:*

	PNW
FY 94	19,000
FY 95	0

9. *Duration of the Study*:

Initiation Date:	FY 90
Scheduled Completion Date:	FY 95

October 1994

Fundamental COPE
Annual Report

1. *Title:*

Rate of Spread of Phellinus weirii in Living vs. Dead Root Systems

2. *Principal Investigator(s) and Organization(s)*:

Dr. Earl E. Nelson, Research Plant Pathologist, Pacific Northwest Research Station, Corvallis

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6)*:

Reforestation in the Oregon Coast Range

a. Develop and test ways of reducing root rot damage in new plantations.

4. *Study Objective(s)*:

To determine if development of P. weirii is restricted in root systems of harvested trees.

5. *Potential Benefit or Utility of the Study*:

Phellinus weirii (Murr.) Gilb. (laminated root rot) is the most damaging root disease in the northwestern United States and British Columbia. Annual losses are estimated at 4.4 million cubic meters. Once established in a stand, the disease spreads along root systems, passing from tree to tree when an infected root contacts a healthy root. Spread along living root systems increases the radius of infection centers about 34 cm/year. Spread of the fungus after death of the host may be limited by competition from other microorganisms, at least after the first year, but growth in living vs. dead trees has not been objectively compared.

Recent attempts to model important root diseases in the west (including P. weirii) have pointed to information gaps in numerous areas. Spread of the fungus along living roots to expand infection centers during the life of a stand has been established, but spread after harvest (or stand destruction by other means) and, consequently, area of potential inoculum in the succeeding stand are not known. If spread along dead roots continues (at rates different from or similar to those measured in living trees), then areas of potential inoculum some years after stand harvest can be estimated accordingly.

6. *Research Activities*:

a. Accomplishments in FY 94:

All inoculated trees have been harvested, dissected, and data tabulated on presence of Phellinus weirii. Cross plating has begun to substantiate that the P. weirii isolated from inoculated trees was the same clone as that used in inoculating.

Completed cross plating and draft report.

b. Problems Encountered in Meeting Research Obligations for FY 94:

Inoculation success was too low to make statistical analysis possible.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

Nelson, E. E. Rate of growth of Phellinus weirii in living vs. dead root systems. (Final study report is on file.)

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

None.

8. *Estimated Cost*:

	PNW
FY 94	3,000

9. *Duration of the Study*:

Initiation Date:	FY 90
Scheduled Completion Date:	FY 94

October 1994

Fundamental COPE
Annual Report

1. *Title*:

Decision Support System for Reforestation in the Oregon Coast Range

2. *Principal Investigators and Organizations*:

Dr. Lauri Shainsky, Research Ecologist, Pacific Northwest Research Station, Portland
Dr. Steve Knowe, Assistant Professor, Department of Forest Science, OSU, Corvallis
Mr. Pat Cunningham, Statistician, Pacific Northwest Research Station, Corvallis

Other significant contributors who will participate as their time permits:

Don Minore, PNW Research Station, Corvallis.
Mike Newton, OSU College of Forestry, Corvallis.
John Tappeiner, NBS/OSU College of Forestry, Corvallis.
Pete Owston, PNW Research Station, Corvallis.
Bob Shula, OSU College of Forestry, Corvallis.
Bill Emmingham, OSU College of Forestry, Corvallis.
Steve Hobbs, OSU College of Forestry, Corvallis.
Dave Hibbs, OSU College of Forestry, Corvallis.
Steve Radosevich, OSU College of Forestry, Corvallis.

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Reforestation in the Oregon Coast Range.

Develop and test strategies for reforestation that will be effective wherever coastal forests grow, even with constraints on prescribed fire and herbicides.

4. *Study Objective(s)*:

a. Compile and evaluate information available on biotic and abiotic factors (including pre- and post-harvest variables) affecting survival and early growth of conifer and hardwood regeneration. PNW scientists will take the lead in this objective.

b. Develop an expert system for defining and evaluating reforestation alternatives for the Oregon Coast Range. OSU scientists will take the lead in this objective.

5. *Potential Benefit or Utility of the Study*:

Reforestation is a critical step in forest management in the Oregon Coast Range. The reforestation stage is so critical that many alternatives have been tested and a large amount of knowledge obtained both through research and operational experience. However, much of this information is not readily available to land managers and researchers for the purpose of identifying and evaluating regeneration alternatives for a given site within the framework of ecological, environmental, and political constraints. The accessibility of this information is particularly important because of limitations to the use of historically valuable tools such as fire and herbicides.

We propose the development of two parallel tools for use by managers and researchers which will allow maximum accessibility to historical information on reforestation alternatives in the Coast Range and evaluation of those alternatives for a given site. The first tool is a computer-based bibliography of reforestation information from the Coast Range. The second tool is a computer based expert system designed to integrate information accessed from the above-mentioned bibliography with known site history and conditions to formulate and customize reforestation alternatives for the site. The new information on site conditions then becomes part of the information base which can be used in the future on the given site for further alternative formulation and evaluation at the later stages of the reforestation process, as well as on similar sites for alternative formulation and evaluation.

This system is an expansion of the concept behind the VEGPRO system developed at Oregon State University for evaluating vegetation management alternatives. However, this system would incorporate a broader perspective of forest management, thus requiring a broader information base and more decision criteria, and be more closely tied to pre-and post-harvest site and stand conditions.

There are a number of research projects under way on which this project would draw heavily for published and unpublished information. These include several projects which deal with various aspects of modeling and young stand development. In addition there are fundamental and adaptive COPE projects which will provide important information.

Expert systems are also able to incorporate operational information into the decision making and evaluation process. This information would be gathered from public agencies and private companies and be an important part of the data base for the project.

6. *Research Activities:*

a. Accomplishments in FY 94:

Completed conceptual framework of the decision support system.

Completed the literature search for the bibliography.

b. Problems Encountered in Meeting Research Obligations for FY 94:

None.

c. Planned for FY 95:

Continue evaluation and development of expert system.

d. Tasks to be Completed by Fiscal Year Starting in FY 96:

FY 1996
Test and refine expert system and decision base.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

Presented poster at "The Ecology and Management of Oregon Coast Range Forests": A mid-term COPE symposium. Gleneden Beach, Oregon. March 29-30, 1994.

Presented poster at conference "Integrated Forest Vegetation Management: Options and Applications." Richmond, British Columbia. November 29-30, 1993.

Gave a presentation "The silvicultural and economic value of vegetation management in the Pacific Northwest. Southern Weed Science Society, Dallas, Texas. Jan. 17-19, 1994.

Shainsky, L. J. and S. A. Knowe. A conceptual model for simulating and assessing forest regeneration options. Submitted to Forestry Chronicle.

Held advisory panel meetings.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

Bibliography is currently being edited.

c. Planned for FY 95:

Publication of annotated bibliography.

Hold advisory panel meetings.

Participate in field trips, seminars, and workshops as appropriate.

8. *Estimated Cost*:

	PNW	*OSU*	*TOTAL*
FY 94	56,000	30,000	86,000
FY 95	59,000	31,000	90,000
FY 96	62,000	32,000	94,000

9. *Duration of Study*:

Initiation Date:	FY 92
Scheduled Completion Date:	FY 96

October 1994

Fundamental COPE
Annual Report

1. *Title:*

Understory Response to Commercial Thinning in Young Douglas-Fir Stands

2. *Principal Investigator(s) and Organization(s):*

Dr. Peyton W. Owston, Team Leader, USDA Forest Service, Pacific Northwest Research Station, Corvallis

Mr. Sam Chan, Plant Physiologist, USDA Forest Service, Pacific Northwest Research Station, Corvallis

Dr. Donald Minore, Principle Plant Ecologist, USDA Forest Service, Pacific Northwest Research Station, Corvallis

Dr. William H. Emmingham, Professor, Department of Forest Science, OSU, Corvallis

Mr. Stuart Johnston, Silviculturist, Siuslaw National Forest, USDA Forest Service, Mapleton District, Mapleton

This study represents the fundamental research component of the Adaptive COPE study "The Application of Commercial Thinning to Increase Structural Diversity in Young Douglas-fir Stands" (page 145).

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6)*:

Reforestation in the Oregon Coast Range

a. Develop and test strategies for reforestation that will be effective where ever coastal forests grow, even with constraints on fire and herbicides.

b. Identify relationships between wildlife populations, habitat, and wildlife damage to young conifer plantations.

4. *Study Objective(s)*:

a. Determine the abundance and growth of understory plants, including natural and planted trees, under each overstory treatment.

b. Determine the turnover of downed woody debris and rates of organic matter accumulation across the different treatments.

c. Study relationships between stand structure and indices of ecosystem net primary productivity.

d. Study relationships between microsite characteristics that develop under the different overstory treatments.

5. *Potential Benefit or Utility of the Study*:

Prescribing for stand structural and species diversity other than normally found in managed young Douglas-fir plantations has become a major concern of many silviculturists and forest managers in the Oregon Coast Range.

Wildlife biologists and forest ecologists have begun to recognize and understand the relationship between landscape patterns and stand structure to forest ecosystem functions. Although specific stand structural needs are still unknown for many wildlife species, structural patterns resembling mature natural forest have been suggested. Present research suggests that young stands can be manipulated to provide some of these habitat characteristics in a relatively short time frame. This involves thinning young stands to low densities to stimulate rapid growth of dominant trees and allow or encourage development of the understory. Currently, there is little growth and yield data to project stand development of such stands. This project will establish and monitor an array of stand density management regimes designed to establish multi-storied stands.

Our approach is to thin young (20-40 yr) plantations to a variety of densities including normal (100 tpa), wide (60 tpa), and very wide (30 tpa). Controls (200-400 tpa) will be left unthinned. In addition, planting of hardwood and four coniferous species in the understory will test the development of vertical structure and provide a comparison with unplanted areas. These combinations of overstory density and understory management will provided a wide array of vertical structures at various time intervals, and may provide mature natural forest habitat in a shorter time frame than the unmanaged (control) stands.

6. *Research Activities*:

a. Accomplishments in FY 94:

Installation of replications 2 and 3 completed.

Logging of replication 2 (Waldport) and 3 (Hebo) completed.

Planting of replications 2 and 3 completed.

Preliminary analysis of the first year's post treatment data from the Mapleton site (understory, microsite, regeneration, forest floor development) completed.

Post-treatment measurements of understory vegetation, regeneration, microsite, forest floor development, and ecophysiology continued. Data compilation and analysis continued.

b. Problems Encountered in Meeting Research Obligations for FY 94:

None.

c. Planned for FY 95:

Post-treatment measurements of understory vegetation, regeneration, microsite, forest floor development, and ecophysiology. Data compilation and analysis as appropriate.

d. Tasks to be Completed by Fiscal Year Starting in FY 96:

FY 1996
Post-treatment measurements of understory vegetation, regeneration, microsite, and ecophysiology. Data compilation and analysis as appropriate.

FY 1997
Post-treatment measurements of understory vegetation, regeneration, microsite, forest floor development, and ecophysiology. Data compilation and analysis as appropriate.

FY 1998
Final data analyses and synthesis of results.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

Forest environment and understory vegetation before and after commercial thinning. In: The Ecology & Management of Oregon Coast Range Forests: A mid-term COPE symposium. Gleneden Beach, Oregon. March 29-31, 1994.

Silviculture for enhancing structural diversity of young forests-A controlled experiment and simulation of future stand development. In: The Ecology & Management of Oregon Coast Range Forests: A mid-term COPE symposium. Gleneden Beach, Oregon. March 29-31, 1994.

Managing young Douglas-fir stands to foster the development of diverse stand structure and species composition. National silviculture workshop. Asheville, North Carolina. November, 1993.

Emmingham, W. H. and K. Maas. 1994. Survival and growth of conifers released in alder-dominated coastal riparian zones. COPE Report 7(2&3):13-15.

Participated in field trips, seminars, and workshops as appropriate.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

None.

c. Planned for FY 95:

Prepare an article for the **COPE Report**.

Participate in field trips, seminars, and workshops as appropriate.

8. *Estimated Cost*:

	PNW
FY 94	105,000
FY 95	80,000
FY 96	70,000
FY 97	70,000
FY 98	70,000

9. *Duration of the Study*:

Initiation Date: FY 92
Scheduled Completion Date: FY 98

October 1994

Fundamental COPE
Annual Report

1. *Title*:

Economic Strategies and Analysis of Regeneration Alternatives in Coastal Oregon with Constrained Site Treatment Alternatives

2. *Principal Investigator(s) and Organization(s)*:

Dr. J. Douglas Brodie, Professor, Department of Forest Resources, College of Forestry, OSU, Corvallis
Dr. Stephen D. Hobbs, Professor, Department of Forest Science, College of Forestry, OSU, Corvallis

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Reforestation in the Oregon Coast Range

Examine the economics of different reforestation strategies and assess the economic impacts of constraints on fire and herbicides.

4. *Study Objective(s)*:

a. Develop analyses to determine economically optimal site preparation and regeneration techniques for softwoods and hardwoods of commercial importance in the Oregon Coast Range.

b. Develop analyses of optimal regeneration with constraints on specified tools such as prescribed fire and herbicides.

c. Develop analyses of regeneration prescriptions affected by retention of partial overstory and relict stand components.

5. *Potential Benefit or Utility of the Study*:

Concerns about the use of chemicals in the forest environment, air and water quality, and biodiversity/ecosystem management goals have increased the difficulty of regeneration of commercial forests. These concerns have most likely reduced future wood fiber production potentials from public lands and may impinge the potential of private lands.

Limitations on site preparation and post-planting options may result in higher costs of seedling establishment or sparse and erratic stocking success. For many sites, limitations on vegetation management reduce production and extend the time required for full site occupancy with achievement of free-to-grow status. Moreover, retention of overstory and green snags may reduce growth of regenerated stands.

Numerous studies have examined regeneration and other silvicultural treatments applied over the past several decades. This information is available to assess the impacts of treatments and untreated controls. Moreover, there is also operational data that is available. Future volume and value impacts will be projected and analyzed.

Loss of one year's production from an acre, at today's prices, may indicate a loss of $500 in long-run average cash flow from the forest or more than $100 in the present-net-worth of the acre. Such potential gains from timely establishment of full production could lead to replacement treatments or practices for prescribed fire and herbicides.

6. *Research Activities*:

a. Accomplishments in FY 94:

Completed a detailed study plan.

Completed review of relevant regeneration research and operational data sets.

Secured operational cost data.

b. Problems Encountered in Meeting Research Objectives for FY 94:

None.

c. Planned for FY 95:

Model and analyze constrained and unconstrained regeneration regimes with subsequent stand management.

d. Tasks to be Completed by Fiscal Year Starting in FY 96:

FY 1996
Model and analyze biodiversity/ecosystem silvicultural treatments and subsequent stand management. Prepare publications summarizing study results.

7. *Technology Transfer Activities:*

a. Completed in FY 94:

Participated in workshops, seminars, and field trips as appropriate.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

None.

c. Planned for FY 95:

Participate in workshops, seminars, and field trips as appropriate.

8. *Estimated Cost*:

	OSU
FY 94	20,000
FY 95	21,000
FY 96	22,000

9. *Duration of Study*:

Initiation Date	FY 94
Scheduled Completion Date:	FY 96

5

MultiDex™
Quick Reference Index System

LIST OF ANNUAL REPORTS FOR FY 1994
ADAPTIVE COPE STUDIES AND TECHNOLOGY TRANSFER ACTIVITIES

Page

I. *Riparian Zone Management*

A. Modeling Root Reinforcement in Shallow Forest Soils (Arne Skaugset and Marv Pyles, OSU) 109

B. Establishment and Growth of Conifers Under Existing Riparian Vegetation (William Emmingham, Mike Newton and Kathleen Maas, OSU; Mike Cloughesy, Douglas County Extension Service; Ralph Duddles, Coos and Curry Counties Extension Service) 113

C. Active Management of Riparian Zones for Multiple Resources: II. Release of Suppressed and Intermediate Conifers in Alder-Dominated Riparian Zones of the Oregon Coast Range (William Emmingham, Kathleen Maas, and Doug Bateman, OSU) 117

D. Active Management of Riparian Zones for Multiple Resources: III. Influence of Woody Debris Piece Size on Function in Small Streams (Bob Bilby, Weyerhaeuser; Arne Skaugset, OSU; Ron Rhew, U. S. Fish and Wildlife; James Sedell, PNW) 121

E. Stability Assessment of End-Haul Disposal Areas (Arne Skaugset, Marvin Pyles and Clint Davis, OSU; Dave Michael, Keith Mills and John Seward, Oregon Dept. of Forestry) 125

F. Long-term Response of Resident Cutthroat Trout to Forest Harvest in Headwater Drainages of Oregon's Coast Range (Arne Skaugset, James D. Hall and Patrick J. Connolly, OSU) 129

Page

G. Integrated Response of Multiple Forest Resources to Active Management in Riparian Zones of the Oregon Coast Range (Arne Skaugset, Mike Newton and Loren Kellogg, OSU) 133

H. Habitat Relationships of Arboreal Rodents in Managed Forests in the Oregon Coast Range (John P. Hayes, and Eric Horvath, OSU) 137

I. Habitat Relationships and Riparian Zone Associations of Bats in Managed Forests in the Oregon Coast Range (John P. Hayes, OSU and Stephen P. Cross, Southern Oregon State College) 141

II. *Reforestation in the Oregon Coast Range*

A. The Application of Commercial Thinning to Increase Structural Diversity in Young Douglas-fir Stands (William H. Emmingham, John P. Hayes, Kathleen Maas, OSU; Stuart Johnston, Siuslaw National Forest; Sam Chan and Don Minore, PNW) 145

B. Influence of Snag Creation and Commercial Thinning Intensity on Stand Structure and Bird Abundance and Diversity in Managed Forests in the Oregon Coast Range (John P. Hayes, William C. McComb, Stephen D. Hobbs, Robert G. Anthony, and William Emmingham, OSU; and Clint Smith, Oregon Department of Forestry) 149

C. Pruning and Fertilizing Precommercially Thinned Douglas-fir Stands in the Oregon Coast Range (William Emmingham, Duddles, Kathleen Maas, OSU; and Ronald Durham, Menasha Corporation) 153

III. *Technology Transfer Activities* 157

October 1994

Adaptive COPE
Annual Report

1. *Title*:

Modeling Root Reinforcement in Shallow Forest Soils

2. *Principal Investigator(s) and Organization(s)*:

Mr. Arne E. Skaugset, Forest Hydrologist, Forest Engineering Dept. and Adaptive COPE Program, OSU, Hatfield Marine Science Center, Newport
Dr. Marvin R. Pyles, Associate Professor, Department of Forest Engineering, OSU, Corvallis

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Develop, refine, and test systems for predicting and reducing landslides, surface erosion, and sediment delivery to stream channels.

4. *Study Objective(s)*:

a. Develop a process-based, mechanistic model of how tree roots reinforce shallow forest soils.

b. Perform a parameter study or sensitivity analysis of the model.

c. Compare parameter study and model output with results found in the technical literature.

5. *Potential Benefit or Utility of the Study*:

Landslides are the dominant erosional process in the Oregon Coast Range. If excessive sediments become entrained in and/or settle out on streambed gravels, hatching and emergence of salmonid fry may be impaired. More transport resistant sediment can cause stream aggradation which may change the form of and impair the function of the aquatic habitat.

One of the possible causes of accelerated erosion following harvesting is associated with the effect of clearcut silviculture on slope stability. It is hypothesized that the increase in slides is caused, in part, by the decay of harvested tree roots. This hypothesis is based on the concept that the strength of shallow forest soils on steep slopes is due, in part, to reinforcement by roots. When trees are harvested and their roots decay, a reduction in soil strength results. Regeneration of the stand will establish new roots, but a window will exist between harvest and complete regeneration when root reinforcement will be at a minimum. If the reduction in root reinforcement is large enough, and if a storm of the sufficient magnitude to cause slides occurs during this window, accelerated erosion caused by increased landsliding may occur.

There are numerous questions remaining concerning the role of roots in stabilizing steep slopes. Research is needed to quantify the extent of root reinforcement in natural and managed forest areas. Slope stability models exist which require data input concerning root strength and at present, there is not an adequate basis for assigning accurate values for this variable. The goal of this research project is to develop a model that will allow the determination of the magnitude of potential root reinforcement. This will allow for the comparison of the magnitude of root reinforcement with other soil strength parameters so a determination can be made of the importance of root reinforcement at a site.

To better manage the steep forested slopes of the Coast Range, land managers will need to have an increasing knowledge of the actual failure mechanism in shallow forest soils. This research will help develop a detailed understanding of the failure mechanism and in particular the mechanism of root reinforcement.

6. *Research Activities*:

a. Accomplishments in FY 94:

The analytical model has been written in code and is functional. Debugging and fine tuning the model continued. Parameter study and sensitivity analysis has been undertaken.

Compared model output with results available in technical literature.

b. Problems Encountered in Meeting Research Obligations for FY 94:

None.

c. Planned for FY 95:

Summarize the data and validate the analytical model.

Prepare a report of final study results.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

Participated in field trips, seminars, and workshops as appropriate.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

Due to other commitments, completion of results will be presented in FY 95.

c. Planned for FY 95:

Prepare a **COPE Report** article.

Prepare a final report that describes the project model.

Present a seminar on Analytical Model Results.

Seminars, workshops, and symposia as appropriate.

8. *Duration of the Study*:

Initiation Date:	FY 89
Scheduled Completion Date:	FY 95

a. Problem Identification and Technology Transfer Activities for FY 98.

Develop other contributions, [illegible] to be presented at [illegible]

b. Planned for FY 98:

Prepare a COFF Report [illegible]

Prepare a final report that describes the [illegible] results.

Present a [illegible] Annual Report.

Seminars, workshops, and special [illegible]

8. Dissemination of the Study

[illegible]

October 1994

Adaptive COPE
Annual Report

1. *Title*:

Establishment and Growth of Conifers Under Existing Riparian Vegetation

2. *Principal Investigator(s) and Organization(s)*:

Dr. William Emmingham, Professor, Department of Forest Science, OSU, Corvallis
Ms. Kathleen Maas, Research Assistant, Adaptive COPE and Department of Forest Science, OSU, Corvallis
Mr. Mike Cloughesy, Douglas County Forestry Extension Agent, Roseburg
Mr. Ralph Duddles, Coos and Curry Counties Forestry Extension Agent, Coquille
Dr. Mike Newton, Professor, Department of Forest Science, OSU, Corvallis

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Develop silvicultural systems to maintain and improve fish and wildlife habitats in riparian areas and increase conifer development there.

4. *Study Objective(s)*:

a. Quantify survival of conifer seedlings planted under riparian vegetation subjected to overstory and understory manipulation.

b. Quantify growth (height and diameter) of conifer seedlings planted under riparian vegetation subjected to overstory and understory manipulation.

c. Quantify browse damage on protected and unprotected seedlings planted under riparian vegetation subjected to overstory and understory manipulation.

d. Quantify disposition of vexar tubes placed on seedlings planted under riparian vegetation subjected to overstory and understory manipulation.

e. Determine which treatment combinations used, by species, result in the best establishment of coniferous regeneration under riparian vegetation.

5. *Potential Benefit or Utility of the Study*:

In this study growth response and survival of four species of conifers planted under riparian vegetation subjected to overstory and understory manipulation are quantified. This information will provide insight into the effort that must be expended, and the silvicultural strategies that must be used, to obtain coniferous regeneration by planting into riparian forests.

The current Forest Practices Act contains regulations designed to enhance fish habitat, including the retention of conifers in riparian management areas which may eventually serve as woody debris in streams. Because of past natural and man-caused disturbances many riparian areas are dominated by a red alder overstory and a brush understory (principally salmonberry). There are few conifers in many of these stands and limited potential for natural conifer regeneration. Active management to reestablish conifers in these areas may restore the structures and functions desired from riparian vegetation and enhance fisheries and wildlife resources as well as provide timber for harvest.

Strategies for conifer establishment in riparian areas are untested. Emmingham et al. showed that planted hemlock seedlings can survive and grow under upland alder stands and that growth was enhanced by thinning some of the overstory alder. The thinning was done by chemically girdling trees, leaving some shade from standing dead timber. This study will compare killing all or a portion of the overstory trees by both chemically and manually girdling trees, as well as controlling understory vegetation by chemical and manual means. Results will offer insight into the nature of the manipulations of riparian vegetation necessary to create conditions suitable for successful growth of different species of conifer regeneration.

6. *Research Activities*:

a. Accomplishments in FY 94:

Completed collection and analysis of third year response data. Analysis of third year survival and growth data showed that four conifer species (Douglas-fir, Grand fir, western hemlock and western redcedar) were favored by girdling of 1/2 or all of the overstory alder, as compared to no treatment. Treatment of competing understory shrub and herb vegetation also improved performance. Tubing to protect seedlings from browse damage did not improve performance.

b. Problems Encountered in Meeting Research Obligations for FY 94:

None.

c. Planned for FY 95:

Complete five growing season data collection.

d. Tasks to be Completed by Fiscal Year Starting in FY 96:

FY 1996
Measure end of growing season growth and survival, browse damage, and tube disposition (October 1995).

Analyze sixth-year results (Winter 1995-96).

Quantify midsummer cover over planted seedlings (July 1996).

FY 1997
Complete final data collection, analyze, and prepare a draft publication.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

Emmingham, W. H., K. Maas, and G. F. Tucker. Survival and growth of conifers underplanted or released in alder dominated coastal riparian zones. In: The Ecology and Management of Oregon Coast Range Forests: A mid-term COPE Symposium. Gleneden Beach, Oregon. March 29-30, 1994.

Maas, K. and W. Emmingham. Establishment of conifers under existing riparian vegetation in the Oregon coast range. Presented at Northwest Science Association Meeting. Ellensburg, Washington. March, 1994.

Participated in field tours, workshops, and seminars, as appropriate.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

None.

c. Planned for FY 95:

Prepare a **COPE Report** article describing third-year results.

Participate in field tours, workshops, and seminars, as appropriate.

8. *Duration of the Study*:

Initiation Date:	FY 89
Scheduled Completion Date:	FY 97

October 1994

Adaptive COPE
Annual Report

1. *Title*:

Active Management of Riparian Zones for Multiple Resources: II. Release of Suppressed and Intermediate Conifers in Alder-Dominated Riparian Zones of the Oregon Coast Range

2. *Principal Investigator(s) and Organization(s)*:

Dr. William Emmingham, Professor, Department of Forest Science, OSU, Corvallis
Ms. Kathleen Maas, Research Assistant, Department of Forest Science OSU, Corvallis
Mr. Doug Bateman, Research Assistant, Department of Forest Science and Adaptive COPE Program, OSU, Newport

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Develop silvicultural systems to maintain and improve fish and wildlife habitats in riparian areas and increase conifer development there.

4. *Study Objective(s)*:

a. Determine whether suppressed and intermediate conifers released by manipulating overtopping vegetation respond with enhanced diameter and height growth.

b. Determine the characteristics of understory conifers that are best correlated with their response to release.

c. Determine the manipulations of overtopping vegetation that are best correlated with understory conifers response to release.

d. Provide land managers with easily measurable features (both seedling and stand characteristics) from which the success of release operations may be predicted.

5. *Potential Benefit or Utility of the Study*:

Establishment and growth of coniferous trees in riparian zones has been identified as a high priority for riparian zone management in the Oregon Coast Range. From a fish and wildlife perspective, a principal riparian management objective is to ensure recruitment of conifers as large woody debris (LWD) and snags. From a forestry perspective, trees within riparian zones can provide a source of harvestable timber, a portion of which may be utilized under current Forest Practice Regulations.

Presently, many riparian areas in the Coast Range are dominated by red alder rather than conifers because of past natural and human disturbances. Red alder does not attain the desirable size, strength, and decay resistance features of conifers and therefore is less desirable for fish and wildlife habitat. Coniferous trees also grow larger and are usually of higher value than red alder and thus are more desirable for timber.

Substantial numbers of suppressed and intermediate conifers exist in the understory of many alder-dominated riparian zones. Many of these are tolerant species which may eventually gain dominance over the site. Some are intolerant species and will eventually die if not released. Tolerant species left to attain dominance on their own will likely do so very slowly. The stocking of successful tolerant trees that become dominant on their own may also be very sporadic. Growth rates of tolerant species are likely to increase if released, shortening the time to their attainment of a size sufficient to have value as LWD, a usable snag, or a harvestable tree.

Release of understory conifers has been documented in other studies on upland sites. In many cases released conifers responded positively to release with increased height and diameter growth. Response in these studies began immediately after release or following only a short lag time. In some cases existing understory trees responded extremely slowly to release, however. Removing these existing trees and planting seedlings may have reduced the time required for establishment of a coniferous stand. In other cases removal of too much of the overstory resulted in stress and eventual mortality of understory conifers. Little is known about overstory removal responses in riparian stands. This study, in combination with information obtained from the Adaptive COPE study, "Establishment and Growth of Conifers under Existing Riparian Vegetation," will provide managers with a variety of strategies for managing riparian vegetation to obtain the multiple benefits afforded by the presence of conifers.

6. *Research Activities*:

a. Accomplishments in FY 94:

Collected end of growing season data for remaining three sites which will have completed three years of post-treatment growth.

Completed analysis of third year survival and growth data. Analysis of third year survival and growth data showed that Douglas-fir, western hemlock, and western redcedar responded positively in growth to release by girdling or cutting of a small gap in the overstory alder canopy. Survival was not improved by release treatment.

b. Problems Encountered in Meeting Research Obligations for FY 94:

None.

c. Planned for FY 95:

Complete data collection for five growing seasons..

d. Tasks to Be Completed By Fiscal Year Starting in FY 96:

FY 1996
Complete six year data collection and analysis.

FY 1997
Prepare a draft manuscript for publication.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

Emmingham, W. H., K. Maas, and G. F. Tucker. Survival and growth of conifers underplanted or released in alder dominated coastal riparian zones. In: The Ecology and Management of Oregon Coast Range Forests: A mid-term COPE Symposium. Gleneden Beach, Oregon. March 29-30, 1994.

Emmingham W. H., K. Maas. Survival and growth of conifers released from alder dominated riparian zones. Presented at Northwest Science Association Meeting. Ellensburg, Washington. March 1994.

Participated in field trips, seminars, and workshops as appropriate.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

None.

c. Planned for FY 95:

Participate in field trips, seminars, and workshops as appropriate.

8. *Duration of the Study*:

Initiation Date:	FY 90
Scheduled Completion Date:	FY 97

October 1994

Adaptive COPE
Annual Report

1. *Title*:

Active Management of Riparian Zones for Multiple Resources. III. Influence of Woody Debris Piece Size on Function in Small Streams

2. *Principal Investigator(s) and Organization(s)*:

Mr. Arne Skaugset, Forest Hydrologist, Forest Engineering Department and Adaptive COPE Program, OSU, Hatfield Marine Science Center, Newport
Dr. Robert Bilby, Aquatic Ecologist, Weyerhaeuser Company, Western Forestry Research Center, Centralia, Washington
Dr. James R. Sedell, Research Ecologist, Pacific Northwest Research Station, Corvallis
Mr. Ron Rhew, U.S. Fish and Wildlife Service, Portland

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

Identify and explain how various management practices in streams and riparian areas affect fish populations and communities and water quality.

4. *Study Objective(s)*:

Determine the relationship of debris piece size and orientation to debris stability, pool configuration, sediment storage, and fish habitat quantity and quality in small streams.

5. *Potential Benefit or Utility of the Study*:

State and federal riparian zone management regulations require the retention of specified amounts of standing timber along important fish-bearing streams following harvest of adjacent areas. The primary goal of these regulations has been to ensure a continued source of woody debris for streams. While the importance of wood in streams is generally recognized, our knowledge of the way in which characteristics of the debris, such as size, species, or orientation, influence the function of this material in streams of varying sizes is incomplete. The relationship between size of debris and its stability during high flow events also has not been clearly established. A more complete understanding of these interactions would allow the matching of debris characteristics to the needs of a particular stream, thereby maintaining fish habitat in these systems while minimizing landowner costs.

The purpose of this study is to experimentally evaluate the relationship between debris piece size and function in small stream systems of the Oregon Coast Range. Laboratory studies by R. Beschta at Oregon State University have shown a positive relationship between piece size and the size of a pool produced by that piece. Field surveys in southwestern Washington by B. Bilby and J. Ward have generally validated this relationship in larger streams, but the relationship does not appear as clear for small streams.

Experimental placement of pieces of wood of varying sizes in stream channels will be used in this study to examine the relationship between piece size and function. Three treatments (wood diameters of 8, 16, and 24 inches) will be established in each of two study streams. Study sites will be located on small, anadromous fish-bearing streams (channel widths 10-15 feet, Oregon Class I). Piece length in all three treatments will be a minimum of two times the width of the channel. Eight pieces of wood per treatment will be placed in the channel, four oriented perpendicular to the direction of flow and four oriented at a 45° angle to the channel. These two orientations were the most commonly observed during the surveys of streams in southwestern Washington. Unmanipulated reaches located upstream and downstream from treatment reaches will serve as controls.

Changes in channel morphology, sediment accumulation, debris stability, and fish populations at the study sites will be monitored through time. Morphology of the channel at debris placement sites will be carefully mapped prior to installing the wood and then remapped annually. The length of the study will depend upon the occurrence of high flows, which are primarily responsible for shaping the channel and determining the stability of debris pieces. Mapping of fish habitat will also be done along the entire experimental stream reach using the method developed by Bisson and others. Fish population surveys will be conducted during the winter and summer, beginning prior to debris placement in summer 1989 and continuing through the study. The purpose of these surveys is to compare the influence of the three treatments on seasonal use of the areas by salmonid fishes.

6. *Research Activities*:

   a. Accomplishments in FY 94:

      Both physical habitat and fisheries data have been reduced, summarized, and analyzed. Monitored channel changes and fish populations.

   b. Problems Encountered in Meeting Research Obligations for FY 94:

      Additional work originally scheduled to be conducted this year was postponed because of unanticipated time demands associated with the "Integrated Response of Multiple Forest Resources to Active Management in Riparian Zones" study (p. 133).

c. Planned for FY 95:

Continue to monitor channel changes and fish populations. Reduce and analyze data to investigate the effect of piece size on local scour, fish habitat, and fish populations.

d. Tasks to be Completed by Fiscal Year Starting in FY 96:

FY 1996
Continue to monitor channel changes and fish populations. Modify local scour model and fish habitat population models as needed.

FY 1997
Continue to monitor channel changes and fish populations. Modify local scour model and fish habitat population models as needed.

FY 1998
Synthesize, reduce and analyze data. Generate a final scour model. Also, finalize model on the effect of piece size and orientation on habitat and populations.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

Dent, E., A. Skaugset, D. Bateman, and P. Connolly. The effect of woody debris size and orientation on aquatic habitat in Coast Range headwater streams. In: The Ecology and Management of Coast Range Forests: A mid-term COPE symposium. Gleneden Beach, Oregon. March 29-31, 1994.

Participated in seminars, field trips, and workshops, as appropriate.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

See 6.b.

c. Planned for FY 95:

Prepare a manuscript on second-year results.

Prepare an article for the **COPE Report**.

8. *Duration of the Study*:

Initiation Date:	FY 90
Scheduled Completion Date:	FY 98

October 1994

Adaptive COPE
Annual Report

1. *Title*:

Stability Assessment of End-Haul Disposal Areas

2. *Principal Investigator(s) and Organization(s)*:

Mr. Arne E. Skaugset, Forest Hydrologist, Forest Engineering Department and Adaptive COPE Program, OSU, Hatfield Marine Science Center, Newport
Dr. Marvin R. Pyles, Associate Professor, Department of Forest Engineering OSU, Corvallis
Mr. Dave Michael, Geotechnical Specialist, Oregon Department of Forestry, Forest Grove
Mr. Keith Mills, Geotechnical Specialist, Oregon Department of Forestry, Salem
Mr. John Seward, Geotechnical Specialist, Oregon Department of Forestry, Roseburg
Mr. Clint Davis, Graduate Research Assistant, Forest Engineering Dept., OSU, Corvallis

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Develop, refine, and test systems for predicting and reducing landslides, surface erosion, and sediment delivery to stream channels.

4. *Study Objective(s)*:

a. Develop a procedure to determine the location and then rank the stability of potential end-haul disposal areas on a basin scale.

b. Develop a procedure to assess the relative and/or absolute stability of end-haul disposal areas on a site specific scale.

c. Validate the above set of procedures by implementing them in field case studies on basin and site specific scales.

5. *Potential Benefit or Utility of the Study*:

Research results indicate that timber harvesting activities can increase the frequency of landslides on steep, landslide prone slopes of the Pacific Northwest. Some investigators have shown that roads are an important factor associated with the increased incidence of landslides on forest lands. Over the years, management practices have been developed which minimize road related failures. These practices include reducing the amount of land in roads, avoiding road locations in high risk sites, and improving site specific construction and maintenance practices.

One practice used to minimize road related landslides is waste disposal by end-hauling. End-hauling is the practice of moving spoil material, generated from road construction, from unstable sites to more stable locations. This practice is used whenever roads are constructed on slopes greater than 50 to 70 percent. Often, logging engineers will consider many alternatives, including different logging systems and road locations, before electing to end-haul a section of road.

At times however, logging roads must be built through high risk terrain and end-hauling is required. A significant problem in these cases is locating sites for disposal of the spoil material. Relatively flat, stable sites which are most suitable for end-haul disposal are not abundant in steep, landslide prone terrain. This problem has never been investigated rigorously, so there are no formal criteria for choosing end-haul disposal areas. The purpose of this project is to develop a set of procedures for siting end-haul disposal areas on a basin scale and for evaluating the relative and/or absolute stability of these selected areas on a site specific scale.

6. *Research Activities*:

a. Accomplishments in FY 94:

Analyzed data.

b. Problems Encountered in Meeting Research Obligations for FY 94:

None.

c. Planned for FY 95:

None.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

Participated in field trips, seminars, and workshops as appropriate.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

Graduate student accepted a new position in Portland before finishing the final report. Consequently, the report will not be finished until FY 95.

c. Planned for FY 95:

Prepare a **COPE Report** article.

Complete the final study report.

8. *Duration of the Study*:

Initiation Date:	FY 90
Scheduled Completion Date:	FY 95

October 1994

Adaptive COPE
Annual Report

1. *Title*:

Long-term Response of Resident Cutthroat Trout to Forest Harvest in Headwater Drainages of Oregon's Coast Range

2. *Principal Investigators and Organizations*:

Patrick J. Connolly, Graduate Research Assistant, Department of Fisheries and Wildlife, OSU, Corvallis
James D. Hall, Professor, Department of Fisheries and Wildlife, OSU, Corvallis
Arne Skaugset, Instructor, Department of Forest Engineering, OSU and Forest Hydrologist, Adaptive COPE, Hatfield Marine Science Center, Newport

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Identify and explain the effects of various riparian and stream conditions on fish populations and communities.

b. Identify and explain how various past, present, and future management practices in streams and riparian areas affect stream habitat and fish populations in headwater streams.

4. *Study Objective(s)*:

a. Characterize status of cutthroat trout populations in streams bordered by forests that were harvested before adoption of Oregon's Forest Practice Rules in 1972.

b. Characterize stream habitat and riparian zones of stream areas selected for intensive fish population studies.

c. Determine when and how resident coastal cutthroat trout use headwater streams.

d. Evaluate importance of headwater streams to resident coastal cutthroat trout production and maintenance of populations in a basin.

e. Recommend changes, if needed, to current policy and management prescriptions for maintenance of coastal cutthroat trout populations in headwater streams bordered by maturing second growth forests.

5. *Potential Benefit or Utility of the Study*:

A question that needs to be addressed is whether past forest management practices impose limitations to populations of cutthroat trout. Most forests that will be ready for a second or third harvest within the next 30 years were last harvested before the adoption of Forest Practice Rules in 1972. Headwater streams that would qualify for riparian protection today were commonly not afforded riparian protection prior to 1972. Because the recovery time for instream habitat may be longer than the planned rotation period for forest harvest, assessment of the fish population in a second growth drainage targeted for logging may not be indicative of the predisturbance level of fish production.

Few studies have been conducted on coastal cutthroat trout in streams bordered by second growth forest stands older than 20 years. Efforts to describe distribution, habitat use, and basic life history aspects of resident populations of cutthroat trout are needed and will be important in management decisions and prescriptions.

Vast areas of second growth forests are maturing and will be harvested in the near future. Existing streamside prescriptions in the Forest Practice Rules for northwestern Oregon were largely developed from studies (e.g., Alsea Watershed Study) of logging relatively undisturbed stream systems in mature forests. It has not been clearly shown what level of protection that current Forest Practice Rules will provide cutthroat trout populations in formerly logged, headwater drainages.

6. *Research Activities*:

a. Accomplishments in FY 94:

Preliminary results suggest that cutthroat trout populations vary with forest management activities. All unlogged basins studied (n=4) were subjected to wildfire within the last 150 years and supported relatively low populations of cutthroat trout. Basins logged 20-30 years ago (n=7) supported highly variable populations of cutthroat trout including the lowest and highest levels observed during the study. Basins logged 40-60 years ago (n=5) supported moderate populations of cutthroat trout. Densities of cutthroat trout were most highly related to indices of large woody debris and riparian vegetation.

Completed data analysis.

b. Problems Encountered in Meeting Research Obligations for FY 94:

None.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

Connolly, P. and J. D. Hall. July 1994. Status of resident coastal cutthroat trout populations in maturing second-growth basins of the Oregon Coast Range. COPE Report 7(2&3):10-13.

Presentation of "Long-term response of resident cutthroat trout to forest harvest" given at the following meetings:

> The Ecology & Management of Oregon Coast Range Forests: A mid-term COPE symposium. Gleneden Beach, Oregon. March 29, 1994.
>
> Annual meeting of the Oregon Chapter of the American Fisheries Society. Sunriver, Oregon. February 18, 1994.
>
> OSU's Biology Graduate Student symposium. Hatfield Marine Science Center, Newport, Oregon. February 13, 1994.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

Preparation of doctoral dissertation is still underway. Work other than that supported by COPE will be included in the final document.

8. *Duration of Study*:

Initiation Date:	FY 92
Scheduled Completion Date:	FY 94

Adaptive COPE
Annual Report

1. *Title*:

Integrated Response of Multiple Forest Resources to Active Management in Riparian Zones of the Oregon Coast Range

2. *Principal Investigators and Organizations*:

Mr. Arne Skaugset, Forest Hydrologist, Forest Engineering Department, OSU and Adaptive COPE Program, Hatfield Marine Science Center, Newport
Dr. Mike Newton, Professor, Department of Forest Science, OSU, Corvallis
Dr. Loren Kellogg, Associate Professor, Forest Engineering Department, OSU, Corvallis

This study is conducted in cooperation with the Fundamental COPE study: "Harvesting Alternatives in Upland and Riparian Areas", Dr. Loren D. Kellogg, Principal Investigator (page 65).

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Identify and explain how various management practices in streams and riparian areas affect water quality.

b. Characterize wildlife communities in riparian and adjacent upland habitats and assess how changes in habitat affect wildlife species.

c. Develop silvicultural systems to maintain and improve fish and wildlife habitats in riparian areas and increase conifer development there.

d. Test and compare harvesting systems that enable managers to achieve various states of fish and wildlife habitat and levels of timber production in riparian areas.

4. *Study Objective(s)*:

a. To develop a process for prescribing active riparian management and stream enhancement activities in harvest regenerated stands with alder-dominated, debris-poor riparian areas and debris-poor streams.

b. Help identify the logging planning, layout, and operational requirements to carry out the prescribed active riparian management and stream enhancement activities.

c. Quantify the responses of multiple forest resources in the riparian zone to active riparian management and stream enhancement. Specifically:

The effect of stream enhancement activities on the diversity and abundance of aquatic habitat types.

The effect of active riparian zone management on selected water quality parameters.

The effect of active riparian zone management activities on the establishment and growth of conifers in the riparian zone.

The effect of active riparian zone management activities on the diversity and abundance of riparian wildlife habitat types.

5. *Potential Benefit or Utility of the Study*:

In the Oregon Coast Range there are many harvest regenerated stands which are functionally different from the naturally regenerated stands they have replaced. COPE research has shown that riparian areas in these stands are debris poor and, in general, the overstory is dominated by hardwoods, predominantly red alder, with a salmonberry understory. The streams flowing through these stands are, in general, debris poor with less total debris loading, smaller and shorter debris pieces. Furthermore, there is very little conifer regeneration. Finally, it has been hypothesized that management exclusion in riparian zones exacerbates the situation because the alder and salmonberry are retained, which ultimately may lead to salmonberry thickets as the dominant form of streamside vegetation.

The problem of management exclusion encouraging salmonberry thickets in alder dominated riparian zones is currently a subject of research for COPE. Part of this research is directed toward developing silvicultural systems designed to establish and encourage conifers to grow in alder dominated riparian zones and is generally referred to as riparian silviculture. This research has concentrated on plot level studies of the establishment or release of several different species of conifer in alder dominated riparian zones with different levels of both overstory and understory manipulation. However, this research can only help solve part of the problems of getting conifers established in alder dominated riparian zones. These conifers will take 100 or more years to become available to the stream as large woody debris.

To date, existing riparian silviculture research has largely not been interdisciplinary or conducted on an operational scale. It is the goal of this proposal to expand upon existing riparian silviculture and stream enhancement research by combining them on an operational scale. This study will accomplish overstory and understory manipulations by using timber harvesting equipment, nominally a yarder, during harvesting operations. Woody debris will be simultaneously added to the streams during the harvesting operation using a yarder.

This research will be done in collaboration with Dr. Loren Kellogg's Fundamental COPE project "Harvesting Alternatives in Upland and Riparian Areas." This cooperation will enable us to develop three research outputs. The first will be a description of the process by which the riparian silviculture and stream enhancement prescriptions are developed. This will involve an interdisciplinary team, including a logging engineer, silviculturist, wildlife biologist, and hydrologist doing an inventory of existing riparian conditions and deficiencies and developing a prescription for the stream and riparian area that involves placing large woody debris in the stream and overstory and/or understory manipulation in the riparian zone along with conifer establishment. The prescription will include logging planning and layout requirements for using a yarder to place large woody debris in a stream as well as manipulate the overstory and/or understory in close proximity to a stream in a riparian zone. The second research output will be the operational constraints, logging feasibility, human safety, logging production and costs associated with carrying out the prescriptions.

The final research output will be a monitoring of the efficacy of the prescriptions. This will include the establishment and growth of the conifers in the riparian zones, the wildlife habitat and perhaps some inventory of the wildlife in the riparian zone, the effects of active management in the riparian zone on water quality and aquatic habitat, and the effect of the large woody debris on fish habitat.

6. *Research Activities*:

a. Accomplishments in FY 94:

First year results for the first two replications have been reduced and summarized.

Reported results from harvest activities. Collected and reduced first-year riparian silviculture and stream enhancement data.

Installed third replication.

b. Problems Encountered in Meeting Research Obligations for FY 94:

None.

c. Planned for FY 95:

Report first-year riparian silviculture and stream enhancement data. Collect and reduce second-year data.

d. Tasks to be Completed by Fiscal Year Starting in FY 96:

FY 1996
Collect third-year data. Report results to date.

FY 1997
Collect fourth-year data. Report results to date.

FY 1998
Analyze and report project results. Synthesize project results with other COPE riparian silviculture and stream enhancement research results.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

Kellogg, L. D., S. J. Pilkerton, and A. E. Skaugset. 1993. Harvesting for active riparian zone management and the effects of multiple forest resources. In: Proceedings of the Council on Forest Engineering 16th Annual Meeting "Environmentally Sensitive Forest Engineering." Savannah, Georgia. Aug. 8-11.

Skaugset, A., L. Kellogg, S. Pilkerton, and M. Miller. 1993. Active riparian zone management: The clearcut approach. WFAC Field Tour. Corvallis, Oregon. October 13-14.

Skaugset, A., L. Kellogg, S. Pilkerton, and M. Miller. 1994. Active riparian zone management: Preliminary logging operations research results. COPE Report 7(1):2-5.

Skaugset, A., E. Dent, D. Bateman, M. Newton, J. Walsh, E. Cole, L. Kellogg, S. Pilkerton, M. Miller, and B. Stringham. Active riparian area management: Effects of forest resources. A poster presentation at a mid-term COPE symposium "The Ecology and Management of Oregon Coast Range Forests." Gleneden Beach, Oregon. March 29-31, 1994.

Presented first-year results as a poster at the Council of Forest Engineering Annual Meeting in Corvallis, August 1994.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

None.

c. Planned for FY 95:

Present poster and participate in seminars, workshops, and symposia as appropriate.

8. *Duration of Study*:

Initiation Date:	FY 92
Scheduled Completion Date:	FY 98

October 1994

Adaptive COPE
Annual Report

1. *Title*:

Habitat Relationships of Arboreal Rodents in Managed Forests in the Oregon Coast Range

2. *Principal Investigators and Organizations*:

Dr. John P. Hayes, Assistant Professor, Department of Forest Science, OSU, and Wildlife Scientist, Adaptive COPE, Hatfield Marine Science Center, Newport

Mr. Eric Horvath, Research Assistant, Adaptive COPE, Hatfield Marine Science Center, Newport

This study is conducted in cooperation with the Adaptive COPE study: The Application of Commercial Thinning to Increase Structural Diversity in Young Douglas-fir Stands (page 145).

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Reforestation in the Coast Range

a. Identify relationships between wildlife populations, habitat, and young conifer plantations.

Riparian Zone Management

a. Characterize wildlife communities in riparian and adjacent upland habitats and assess how changes in habitat affect wildlife species.

4. *Study Objective(s)*:

a. Determine the relationship between forest structure and habitat utilization by arboreal rodents, with an emphasis on habitat utilization of young forests by flying squirrels.

b. Synthesize existing information concerning patterns of habitat utilization, natural history, and biology of the red tree vole, emphasizing aspects pertinent to forest management, including stand species composition, stand age, stocking density, vegetative community characteristics, and landscape patterns.

c. Determine the value and feasibility of additional field research on arboreal rodents in young and managed forests in the Oregon Coast Range.

5. *Potential Benefit or Utility of Study*:

Recent studies, several of them funded by the COPE program, have made substantial progress toward answering questions concerning the influence of various forest management practices on wildlife populations. These studies have demonstrated that different wildlife species exhibit varying degrees of sensitivity to changes in forest structure. Initial research indicates that arboreal rodents may be particularly sensitive to forest structure. There has been considerable speculation concerning the response of arboreal rodents to forest management. Although some initial research has suggested that arboreal rodents are closely associated with late seral stage forests, few empirical studies are available for the development of informed management programs, and virtually no data are available from Oregon Coast Range forests. The paucity of information is particularly evident for questions concerning use of young forest stands by flying squirrels and our ability to silviculturally create suitable habitat for arboreal rodents (i.e., through application of commercial thinning). In addition, information concerning habitat relationships of one species of arboreal rodent, the red tree vole, is very poor and is scattered in sometimes obscure sources.

Arboreal rodents are important components of regional biodiversity. They play a critical role in energy flow in Oregon Coast Range forests, and are important in dispersal of the spores of mycorrhizal fungi. In addition, arboreal rodents are the primary prey species of many predators, including the northern spotted owl. A better understanding of the habitat relationships of arboreal rodents will facilitate the decision-making process for forest resource managers. This study will provide information essential to understanding how various silvicultural and management activities influence arboreal rodent populations in managed forests in the Oregon Coast Range.

The proposed project is exploratory and thus is of relatively short duration. Rather than proposing an extensive and long-term research program, the more cautious approach of assessing the value of further work once preliminary data can be analyzed, is proposed. However, the study is designed to be a valid entity in itself, and should yield significant results. The dual nature of the project (field research and literature synthesis) is consistent with the exploratory nature of the proposed project. Both activities will enhance our understanding of habitat relationships of arboreal rodents in managed forests in the Oregon Coast Range and will provide solid ground to assess the value of further work on arboreal rodents.

6. *Research Activities*:

a. Accomplishments in FY 94:

Assessed the value of additional field work and entered a collaborative effort with the Oregon Cooperative Wildlife Research Unit to examine the effects of commercial thinning on arboreal rodent populations (see Adaptive COPE study "Influence of Snag Creation and Commercial Thinning Intensity on Stand Structure and Bird Abundance and Diversity in Managed Forests in the Oregon Coast Range" page 149).

Completed analysis of field data.

b. Problems Encountered in Meeting Research Obligations for FY 94:

None.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

Hayes, J. P., E G. Horvath, and P. Hounihan. 1994. Securing live traps to small diameter trees for studies of arboreal mammals. Northwestern Naturalist 75:31-33.

Hayes, J. P., E. G. Horvath, and P. Hounihan. Chipmunk populations in Douglas-fir plantations and mature forests in the Oregon Coast Range. Submitted to Canadian Journal of Zoology.

Hayes, J. P. Phenacomys longicaudus. Submitted to Mammalian Species.

Contributed to appropriate field tours, seminars, and workshops.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

None.

8. *Duration of the Study*:

Initiation Date:	FY 93
Scheduled Completion Date:	FY 94

October 1994

Adaptive COPE
Annual Report

1. *Title*:

Habitat Relationships and Riparian Zone Associations of Bats in Managed Forests in the Oregon Coast Range

2. *Principal Investigator(s) and Organization(s)*:

Dr. John P. Hayes, Assistant Professor, Department of Forest Science, College of Forestry, OSU, Corvallis

Dr. Stephen P. Cross, Professor, Department of Biology, Southern Oregon State College, Ashland

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Identify wildlife species in and adjacent to riparian habitats.

b. Characterize wildlife communities in riparian and adjacent upland habitats and assess how changes in habitat affect wildlife species.

4. *Study Objective(s)*:

a. To identify bat species using riparian zones in Oregon Coast Range forests.

b. To determine the influence of landscape structure, forest structure, and stream and riparian characteristics on patterns of habitat utilization by bats.

c. To determine the influence of forest structure on roost site selection by bats in and adjacent to riparian areas.

5. *Potential Benefit or Utility of the Study*:

Understanding the costs and benefits of management strategies is essential to informed management of forest ecosystems in the Oregon Coast Range. Studies of several species of vertebrates are beginning to clarify the relationships between wildlife and habitat structure and are enabling evaluation of the influence of management programs on wildlife populations. One important wildlife group that has been neglected in these studies is the bats.

Bats are extremely important to the region's biodiversity and ecology. Nearly 20 percent of the mammal species occurring in the Oregon Coast Range are bats. Of the 13 species of bats occurring in the Coast Range and Siskiyous, three are listed as sensitive species by the Oregon Department of Fish and Wildlife, and one of these is a candidate for federal threatened or endangered status. Bats are significant predators of nocturnal insects, some of which are forest pests. In addition, bats are prey to some species of mammalian and avian predators.

The single study to date that has examined bat communities in the Oregon Coast Range showed that the abundance and diversity of bats respond dramatically to variation in forest structure in upland habitat; upland habitat is used by many species of bats primarily as roosting habitat. Riparian zones are used by bats for both roosting and foraging. Although there is some evidence suggesting that bat populations may be influenced by habitat structure in riparian zones, no definitive studies have examined this relationship. In light of the importance of bats to forest ecology and regional biodiversity, the sensitive status of some species of bats, the possible influences of land management practices on bat population viability, and the paucity of information on riparian habitat associations of bats, we consider research on bat habitat associations in riparian zones and adjacent upland habitats to be a priority.

This study will provide the scientific basis for appraisal of management alternatives that may influence bat populations in and adjacent to riparian areas.

6. *Research Activities*:

   a. Accomplishments in FY 94:

      Preliminary study sites have been selected.

      Began preliminary data collection.

   b. Problems Encountered in Meeting Research Obligations for FY 94:

      None.

   c. Planned for FY 95:

      Collect data and conduct preliminary data analysis.

   d. Tasks to be Completed by Fiscal Year Starting in FY 96:

      FY 1996
      Collect data and conduct data analysis.

      FY 1997
      Complete data collection and analysis.

Begin data synthesis and preparation of manuscripts.

FY 1998
Complete manuscripts.

7. *Technology Transfer Activities*:

a. Accomplishments to Date for FY 94:

Hayes, J. P. and P. Hounihan. 1993. Spatial and temporal variation in bat activity in echolocation monitoring studies. Bat Research News 34:111 (abstract).

Hayes, J. P. and P. Hounihan. Temporal variation in bat activity and its importance in the design of echlocation monitoring studies. Presentation at the 75th Annual Meeting of the American Society of Mammalogists. Washington, D.C. June 22, 1994.

Hayes, J. P. and P. Hounihan. 1994. Field use of the Anabat II bat detector system to monitor bat activity. Bat Research News 35:1-3.

Hayes, J. P. and Patrick Hounihan. Spatial and temporal variation in bat activity in echolocation monitoring studies. Presentation at the 23rd annual North American Symposium on Bat Research. University of Florida, Gainesville. October 16, 1993.

Hayes, J. P. Research on bat populations in the coast range. Presentation for the Hatfield Marine Science Center Seminar Series. Newport, Oregon. December 8, 1993.

Hayes. John P. Research on bat populations in riparian areas of the Oregon Coast Range. In: The Ecology and Management of Oregon Coast Range Forests: A mid-term COPE symposium. Gleneden Beach, Oregon. March 29, 1994.

Participated in field trips, workshops, and seminars as appropriate.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

None.

c. Planned for FY 95:

Participate in field trips, workshops, and seminars as appropriate.

8. *Duration of Study*:

Initiation Date: FY 94
Scheduled Completion Date: FY 98

October 1994

Adaptive COPE
Annual Report

1. *Title*:

The Application of Commercial Thinning to Increase Structural Diversity in Young Douglas-Fir Stands

2. *Principal Investigators and Organizations*:

Dr. William H. Emmingham, Professor, Department of Forest Science, OSU, Corvallis
Mr. Stuart Johnston, Silviculturist, Siuslaw National Forest, USDA Forest Service, Mapleton District, Mapleton
Mr. Sam Chan, Research Forester, USDA Forest Service, Pacific Northwest Research Station, Corvallis
Ms. Kathleen Maas, Research Assistant, Department of Forest Science, OSU, Adaptive COPE, Hatfield Marine Science Center, Newport
Dr. Donald Minore, Principle Plant Ecologist, USDA Forest Service, Pacific Northwest Research Station, Corvallis

This study is conducted in cooperation with the Fundamental COPE studies: "Harvesting Alternatives in Upland and Riparian Areas in the Oregon Coast Range," Dr. Loren Kellogg, Principal Investigator (page 65) and "Understory Response to Commercial Thinning in Young Douglas-fir Stands," Peyton Owston et al., Principal Investigators (page 99).

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Reforestation in the Oregon Coast Range

a. Develop and test strategies for reforestation that will be effective where ever coastal forests grow, even with constraints on fire and herbicides.

b. Characterize wildlife habitat, structure, and wildlife damage to young conifer plantations.

Riparian Zone Management

a. Characterize wildlife communities in riparian and adjacent upland habitats.

4. *Study Objective(s)*:

The primary objective of this study is to evaluate the effect of various commercial thinning and planting regimes on stand structural diversity relative to:

a. Behavior of overstory trees; survival, growth, and crown structure.

b. Dynamics of stand structure/architecture over time.

c. Response of wildlife habitat to stand manipulation.

d. Silviculture investments and costs.

5. *Potential Benefit or Utility of the Study*:

Prescribing for stand structural and species diversity other than normally found in managed young Douglas-fir plantations has become a major concern of many silviculturists and forest managers in the Oregon Coast Range.

Wildlife biologists and forest ecologists have begun to recognize and understand the relationship between landscape patterns and stand structure to forest ecosystem functions. Although specific stand structural needs are still unknown for many wildlife species, structural patterns resembling mature natural forest have been suggested. Present research suggests that young stands can be manipulated to provide some of these habitat characteristics in a relatively short time frame. This involves thinning young stands to low densities to stimulate rapid growth of dominant trees and allow or encourage development of the understory. Currently, there is little growth and yield data to project stand development of such stands. This project will establish and monitor an array of stand density management regimes designed to establish multi-storied stands.

Our approach is to thin young (20-40 yr) plantations to a variety of densities including normal (100 tpa), wide (60 tpa), and very wide (30 tpa). Controls (200-400 tpa) will be left unthinned. In addition, planting of alder and four coniferous species in the understory will be planted to test the development of vertical structure and provide a comparison with unplanted areas. These combinations of overstory density and understory management will provide a wide array of vertical structures at various time intervals, and may provide mature natural forest habitat in a shorter time frame than the unmanaged (control) stands.

6. *Research Activities*:

a. Accomplishments in FY 94:

Harvest of replication 2 (Waldport) and 3 (Hebo) completed.

All growth and yield and species trial plots underplanted for replications 2 and 3.

Initiation of this study is complete with plot installation, logging and planting of the second and third replications. Studies of logging efficiency were carried out during the logging operations.

Post-treatment sampling of silviculture and wildlife habitat was completed.

b. Problems Encountered in Meeting Research Obligations for FY 94:

None.

c. Planned for FY 95:

All 1993 growth year data for species trials collected.

Post-treatment sampling of silviculture and wildlife habitat completed.

d. Tasks to be Completed by Fiscal Year Starting in FY 96:

FY 1996
Post-treatment sampling of silviculture and wildlife habitat.

FY 1997
Post-treatment sampling of silviculture and wildlife habitat

FY 1998
Final data analyses and synthesis of results.

7. *Publication and Technology Transfer Activities*:

a. Completed in FY 94:

Participated in field trips, workshops, and seminars as appropriate.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

None.

c. Planned for FY 95:

Participate in field trips, workshops, and seminars as appropriate.

8. *Duration of Study*:

Initiation Date:	FY 92
Scheduled Completion Date:	FY 98

October 1994

Adaptive COPE
Annual Report

1. *Title*:

Influence of Snag Creation and Commercial Thinning Intensity on Stand Structure and Bird Abundance and Diversity in Managed Forests in the Oregon Coast Range

2. *Principal Investigator(s) and Organization(s)*:

Dr. John P. Hayes, Assistant Professor, Department of Forest Science, College of Forestry, OSU, Corvallis and Wildlife Scientist, Adaptive COPE, Hatfield Marine Science Center, Newport

Dr. William Emmingham, Professor, Department of Forest Science, OSU, Corvallis and Silviculturist, Adaptive COPE, Hatfield Marine Science Center, Newport

Mr. Clint Smith, Wildlife Biologist, Oregon Department of Forestry, Salem

Dr. Stephen D. Hobbs, Professor, Department of Forest Science, OSU, Corvallis

Dr. Robert G. Anthony, Professor, Department of Fisheries and Wildlife, OSU, Corvallis; Assistant Leader, Oregon Cooperative Wildlife Research Unit, National Biological Survey, Corvallis

Dr. William C. McComb, Professor, Department of Forest Science, OSU Corvallis

Mr. Michael D. Adam, Research Assistant, Adaptive COPE, Hatfield Marine Science Center, Newport

Mr. Nobuya Suzuki, Graduate Student, Department of Forest Science, OSU, Corvallis

Ms. Jennifer Weeks, Graduate Student, Department of Forest Science, OSU, Corvallis

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Reforestation in the Oregon Coast Range

a. Identify relationships between wildlife populations, habitat, and young conifer plantations.

Riparian Zone Management

a. Characterize wildlife communities in riparian and adjacent upland habitats and assess how changes in habitat affect wildlife species.

b. Develop silvicultural systems to maintain and improve fish and wildlife habitats in riparian areas.

4. *Study Objective(s)*:

a. To determine the influence of different densities of created snags and different commercial thinning intensities on bird abundance and diversity.

b. To determine the influence of different commercial thinning intensities on the abundance and diversity of small mammals and amphibians.

c. To determine the influence of forest gaps created by snags and commercial thinning on natural regeneration of conifers and hardwoods.

5. *Potential Benefit or Utility of the Study*:

Considerable acreage in the Oregon Coast Range, on both publicly and privately managed lands, is in an early seral stage of development as a result of fire history or forest management practices. Recently, there has been increased interest in enhancing wildlife values while simultaneously producing fiber for wood products.

Commercial thinning has been proposed as a means to meet various resource needs in Oregon Coast Range forests, including enhancing stand structural and wildlife diversity and increasing wood fiber production. Silvicultural prescriptions for commercial thinning focused on increasing wood fiber production are well established and are based on a considerable number of theoretical and applied studies as well as a substantial base of practical experience. However, there is considerably less information concerning the best way to incorporate wildlife goals into these young stands through silvicultural prescriptions. Although some preliminary work has addressed this question, fundamental questions concerning the response of wildlife populations to thinning activities and snag creation remain unanswered. As a result, the implications of various management strategies on wildlife populations remain unclear. This study will examine the influence of snag density and commercial thinning intensity on wildlife populations and conifer and hardwood natural regeneration in managed stands in the Oregon Coast Range.

6. *Research Activities*:

a. Accomplishments in FY 94:

Identified study sites.

Completed a study plan.

Collected pre-treatment data on bird populations.

Collected pre-treatment data on small mammal and amphibian populations.

Collected pre-treatment data on habitat structure.

Collected pre-treatment data on natural regeneration of conifers.

Commercially thinned study areas.

b. Problems Encountered in Meeting Research Transfer Obligations for FY 94:

None.

c. Planned for FY 95:

Collect post-treatment data on wildlife populations.

Collect natural conifer and hardwood regeneration data.

d. Tasks to be Completed by Fiscal Year Starting in FY 96:

FY 1996
Collect natural conifer and hardwood regeneration data.

FY 1997
Monitor post-treatment bird populations.

Monitor selected snags for decay and bird use.

Collect natural conifer and hardwood regeneration data.

FY 1998
Data analyses and information synthesis.

Prepare manuscripts.

7. *Technology Transfer Activities*:

a. Completed in FY 94:

Hayes, John P., William H. Emmingham, Clint Smith, Stephen P. Hobbs, Robert G. Anthony, Nobuya Suzuki, Michael Adam, and William C. McComb. The influence of commercial thinning on wildlife populations and stand structure: A new COPE study. Poster presented at The Ecology and Management of Oregon Coast Range Forests: A mid-term COPE Symposium: Gleneden Beach, Oregon. March 29, 1994.

Hayes, J. P. and W. H. Emmingham. A new study on the influence of commercial thinning on wildlife populations and stand structure. Presentation at the Regional Council on Silvicultural Alternatives. H. J. Andrews Experimental Forest. May 17, 1994.

Hayes, J. P. Commercial thinning and wildlife populations. Presentation at a field tour for members of the Washington County Chapter of the Oregon Small Woodlands Association. June 11, 1994.

Hayes, J. P. Commercial thinning and wildlife populations. Presentation for OSU administrators and timber industry representatives at OSU Educator's Day. Corvallis, OR. August 3, 1994.

Participated in field trips, workshops, and seminars as appropriate.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

None.

c. Planned for FY 95:

Conduct a field tour on commercial thinning and its influence on stand structure, wildlife habitat, and wildlife populations.

Prepare an article for the **COPE Report**.

Participate in field trips, workshops, and seminars as appropriate.

8. *Duration of Study*:

Initiation Date:	FY 94
Scheduled Completion Date:	FY 98

October 1994

Adaptive COPE
Annual Report

1. *Title*:

Pruning and Fertilizing Precommercially Thinned Douglas-fir Stands in the Oregon Coast Range

2. *Principal Investigator(s) and Organization(s)*:

Dr. William Emmingham, Professor, Department of Forest Science, OSU, Corvallis and Silviculturist, Adaptive COPE, Hatfield Marine Science Center, Newport
Mr. Ralph Duddles, Forestry Extension Agent, OSU Extension Service, Coquille, Oregon
Mr. Ronald Durham, Forester, Menasha Corporation, Coos Bay, Oregon
Ms. Kathleen Maas, Research Assistant, Adaptive COPE, Hatfield Marine Science Center, Newport

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

This study complements other existing COPE studies which address intermediate stand treatments, an area of concern that emerged in 1992.

4. Study Objective(s):

a. To determine the efficacy of fertilizing young precommercially thinned Douglas-fir stands.

b. To determine the efficacy of fertilizing pruned young precommercially thinned Douglas-fir stands.

c. To quantify the growth, form, and branch size of trees in fertilized and unfertilized plots in stands that have:

(1) no treatment
(2) been precommercially thinned
(3) been precommercially thinned and pruned

5. *Potential Benefit or Utility of the Study*:

With increasing scarcity of timber, forest managers need to know how much they can increase forest volume and value yield from intensive forestry practices including thinning, pruning and fertilization. Many studies have looked at fertilization of Douglas-fir stands in the commercial thinning size/age range. A few studies have looked at pruning Douglas-fir. It is well known that fertilization should be combined with proper thinning regimes. There are no studies in the Oregon Coast Range that investigate the combined effects of pruning and fertilization on young, precommercially thinned Douglas-fir stands.

The practice of fertilizing Douglas-fir is well founded in trials established by the Pacific Northwest Stand Management Cooperative research program at the University of Washington. Operationally, forest fertilization is practiced on thousands of acres each year. The most cost effective programs fertilize thinned stands that can be harvested or thinned again in 6-10 years. This approach minimizes the length of time between investment and return.

Recent studies by the Pacific Northwest Research Station (USDA Forest Service) have demonstrated that trees pruned 20-30 years ago will produce enough value when they are properly milled to more than pay for the investment in pruning, including interest. This has sparked interest in the practice of pruning, especially since high quality clear wood from old growth and mature forests has become scarce. Internationally, serious forestry enterprises have already begun investing heavily in pruning, e.g. New Zealand.

Our approach is to investigate the earliest possible opportunity to capitalize on the well known growth response produced by fertilizing thinned stands, i.e. at the time of precommercial thinning. The study will be conducted on Menasha Corp. lands near Coos Bay. The area is located within a 15 minute drive from Coos Bay, and is adjacent to the Menasha Demonstration Forest.

6. *Research Activities*:

a. Accomplishments in FY 94:

Study plots were laid out with random assignment of six treatments in three replications. All plots are within a few miles of each other.

Precommercial thinning, pruning and fertilization treatments installed.

Immediate post treatment data collected.

Data base established with summary of initial conditions.

b. Problems Encountered in Meeting Research Obligations for FY 94:

None.

c. Planned for FY 95:

Prepare an establishment report.

d. Tasks to be Completed by Fiscal Year Starting in FY 96:

FY 1996
No action required.

FY 1997
Collect fourth year response data.

FY 1998
Final data analysis and synthesis of results.

7. *Technology Transfer Activities*:

a. Completed in FY 94:

Participated in field trips, workshops, and seminars as appropriate.

b. Problems Encountered in Meeting Technology Transfer Obligations for FY 94:

None.

c. Planned for FY 95:

Participate in field trips, workshops, and seminars as appropriate.

8. *Duration of Study*:

Initiation Date:	FY 94
Scheduled Completion Date:	FY 98

October 1994

Adaptive COPE
Annual Report

1. *Title*:

Technology Transfer Activities

2. *Principal Investigator(s) and Organization(s)*:

Adaptive COPE Team, College of Forestry, OSU, Newport.

3. *Technology Transfer Accomplishments in FY 94*:

a. Workshops:

Conducted a symposium entitled "The Ecology and Management of Oregon Coast Range Forests: A Mid-term COPE Symposium." (approximately 250 participants)

Alternative Silviculture Treatments: Applications from Long-term studies. Two day field tour sponsored by Western Forestry and Conservation Association, OSU College of Forestry, and Adaptive COPE. October 13-14, 1993. (90 participants)

Cosponsored and facilitated a meeting of the Regional Council on Silvicultural Alternatives.

b. Other Activities:

Prepared four issues of the quarterly newsletter **COPE Report**.

Connolly, P. Long-term response of resident cutthroat trout to forest harvest. Presented at OSU's Biology Graduate Student symposium. Hatfield Marine Science Center, Newport, Oregon. February 13, 1993.

Connolly, P. Long-term response of resident cutthroat trout to forest harvest. Presented at Annual meeting of the Oregon Chapter of the American Fisheries Society. Sunriver, OR. February 18, 1994.

Connolly, P. Long-term response of resident cutthroat trout to forest harvest. Presented at "The Ecology & Management of Oregon Coast Range Forests": A mid-term COPE symposium. Gleneden Beach, Oregon. March 29, 1994.

Dent, E., A. Skaugset, D. Bateman, and P. Connolly. The effect of woody debris size and orientation on aquatic habitat in coast range headwater streams. In: "The Ecology and Management of Oregon Coast Range Forests": A mid-term COPE Symposium.

Gleneden Beach, Oregon. March 29-31, 1994.

Emmingham, W. H. and K. Maas. Survival and growth of conifers released from alder dominated coastal riparian zones. Presented at the Northwest Science Association's Annual Meeting. Ellensburg, Washington. March 24-25, 1994.

Emmingham, W. H., K. Maas, and G. F. Tucker. Survival and growth of conifers underplanted or released in alder dominated coastal riparian zones. Presented at the "The Ecology and Management of Oregon Coast Range Forests": A mid-term COPE symposium. Gleneden Beach, Oregon. March 29-30, 1994.

Hayes, J. P. Research on bat populations in the coast range. Presentation for the Hatfield Marine Science Center Seminar Series. Newport, Oregon. December 8, 1993.

Hayes, J. P. and P. Hounihan. Spatial and temporal variation in bat activity in echolocation monitoring studies. Presentation at the 23rd annual North American Symposium on Bat Research. University of Florida, Gainesville. October 16, 1993.

Hayes. John P. and P. Hounihan. Research on bat populations in riparian areas of the Oregon Coast Range. In: The Ecology and Management of Oregon Coast Range Forests: A mid-term COPE symposium. Gleneden Beach, Oregon. March 29, 1994.

Hayes, J. P., W. H. Emmingham, C. Smith, S. D. Hobbs, R. G. Anthony, N. Suzuki, M. Adam, and W. C. McComb. The influence of commercial thinning on wildlife populations and stand structure: A new COPE study. Poster presented at "The Ecology and Management of Oregon Coast Range Forests": A mid-term COPE Symposium. Gleneden Beach, Oregon. March 29, 1994.

Hayes. John P. Scientific considerations in natural resource management. Lecture given for course "Environmental Anthropology" at Oregon State University. April 5, 1994. (approximately 80 students)

Hayes, J. P. Methods for studying bat populations. Presented to course "wildlife Techniques" at OSU. Corvallis, OR. May 16, 1994.

Hayes, J. P. and W. H. Emmingham. A new study on the influence of commercial thinning on wildlife populations and stand structure. Presented at the meeting of the Regional Council on Silvicultural Alternatives. May 17, 1994.

Hayes, J. P. Commercial thinning and wildlife populations. Presented to the Washington County chapter of the Oregon Small Woodlands Association. June 11, 1994.

Hayes, J. P. and P. Hounihan. Temporal variation in bat activity and its importance in the design of echolocation monitoring studies. Presented at the 75th Annual Meeting of the American Society of Mammalogists. Washington, D.C. June 22, 1994.

Hayes, J. P. Commercial thinning and wildlife populations. Presented at a field tour of OSU Educator's Day. August 3, 1994.

Hayes, J. P. Perspectives on biodiversity. Presented at OSU Forestry Extension's "Ecosystem Management Form." August 9, 1994.

Hayes, J. P. Phenacomys longicaudus. Submitted to Mammalian Species.

Hayes, J. P. and P. Hounihan. 1993. Spatial and temporal variation in bat activity in echolocation monitoring studies (abstract). Bat Research News 34:111.

Hayes, J. P. and P. Hounihan. 1994. Habitat relationships and riparian zone associations of bats in managed forests in the Oregon Coast Range: A new Adaptive COPE study. COPE Report 7(2&3):5-7.

Hayes, J. P. and P. Hounihan. 1994. Field use of the Anabat II bat detector system to monitor bat activity. Bat Research News 35:1-3.

Hayes, J. P., E. G. Horvath, and P. Hounihan. Townsend's chipmunk populations in Douglas-fir plantations and mature forests in the Oregon Coast Range. Submitted to Canadian Journal of Zoology.

Kellogg, L. D., S. J. Pilkerton, and A. E. Skaugset. Harvesting for active riparian zone management and the effects of multiple forest resources. In: Proceedings of the Council on Forest Engineering 16th Annual Meeting "Environmentally Sensitive Forest Engineering." Savannah, Georgia. Aug. 8-11, 1993.

Lavender, D. P. and W. H. Emmingham. Comparing growth of Douglas-fir (Pseudotsuga menziesii [mirb. franco]) and red alder (alnus rubra bong) in a mixed cluster plantation with standard grid plantations. Presented at the Northwest Science Association's Annual Meeting. Ellensburg, Washington. March 24-25, 1994.

Maas, K. and W. Emmingham. Establishment of conifers under existing riparian vegetation in the Oregon coast range. Presented at the Northwest Science Association's Annual Meeting. Ellensburg, Washington. March 24-25, 1994.

Skaugset, A., L. Kellogg, S. Pilkerton, and M. Miller. Active riparian area management research project; overview and update. Presented at Western Forestry and Conservation Field Tour. October 13, 1993. (approximately 70 participants)

Skaugset, A., E. Dent, D. Bateman, M. Newton, J. Walsh, E. Cole, L. Kellogg, S. Pilkerton, M. Miller, and B. Stringham. Active riparian area management: Effects on forest resources. A poster presentation at "The Ecology and Management of Oregon Coast Range Forests": a mid-term COPE symposium. Gleneden Beach, Oregon. March 29-31, 1994.

Skaugset, A. E. and R. Beschta. Riparian protection and riparian area or stream enhancement. Presented at a field tour sponsored by the Oregon Department of Forestry. Veneta, OR. June 21, 1994.

Skaugset, A. E., E. Dent, D. Bateman, M. Newton, J. Walsh, E. Cole, L. Kellogg, S. Pilkerton, M. Miller, and B. Stringham. Active riparian area management: Effect on Forest resources. Posted presented at Advanced Technology in Forest Operations: Applied Ecology in Action. July 24-29, 1994.

Skaugset, A., L. Kellogg, S. Pilkerton, and M. Miller. 1994. Active riparian zone management: Preliminary logging operations research results. COPE Report 7(1):2-5.

Tucker, G. F., S. R. Johnston, Wm. H. Emmingham, and S. L. Garman. Silviculture of enhancing structural diversity of young forests-A controlled experiment and simulations of future stand development. Presented at the "The Ecology and Management of Oregon Coast Range Forests": A mid-term COPE symposium. Gleneden Beach, Oregon. March 29-30, 1994.

Prepared an annual report.

Prepared a manuscript on survey of land managers on forest road drainage.

4. *Problems Encountered in Meeting Technology Transfer Obligations for FY 94*:

a. Workshops:

None.

b. Other Activities:

None.

5. *Technology Transfer Plans for FY 95:*

a. Workshops:

Conduct a field tour on commercial thinning and its influence on stand structure, wildlife habitat, and wildlife populations.

Conduct a workshop on using cable logging equipment to place large woody debris in streams during the harvesting process to enhance aquatic habitat.

b. Other Activities:

Prepare a manuscript on genetic considerations in landscape management.

Prepare 4 issues of the **COPE Report**.

Prepare an annual report.

Continue to increase public awareness of the COPE Program through the media and presentations to civic groups.

Continue to work closely with resource managers through office visits and field tours.

6

MultiDex™
Quick Reference Index System

LIST OF FUNDAMENTAL COPE WORK PLANS FOR FY 1995

Page

I. *Riparian Zone Management*

Slope Stability Synthesis Project (Arne Skaugset and Marvin Pyles, OSU) 165

II *Reforestation in the Oregon Coast Range*

Laminated Root Rot of Douglas-fir in Western North America (Walter G. Thies, PNW; and Rona N. Sturrock, Canadian Forest Service) 167

III. *Riparian Zone Management and Reforestation in the Oregon Coast Range*

Integrated Resource Management Book (Stephen D. Hobbs, William C. McComb, OSU; Gordon H. Reeves and Thomas A. Spies, PNW) 169

October 1994

Fundamental COPE
Work Plan

1. *Title*:

Slope Stability Synthesis

2. *Principal Investigator(s) and Organization(s)*:

Mr. Arne E. Skaugset, Instructor, Department of Forest Engineering, College of Forestry, OSU, Corvallis
Dr. Marvin R. Pyles, Associate Professor, Department of Forest Engineering, College of Forestry, OSU, Corvallis

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*

Riparian Zone Management

Develop, refine, and test systems for predicting and reducing landslides, surface erosion and sediment delivery to stream channels.

4. *Study Objective(s)*:

To combine both correlative and analytical slope stability research outputs to produce a "management tool" which is usable by field forestry personnel.

5. *Justification*:

The COPE Program has sponsored five slope stability research studies. These are:

a. Forest Management on Landslide-Prone Sites: Stability Evaluation, Effectiveness of Leave Areas, and Effects of Landslides on Riparian and Fisheries Resources. Investigators: Hank Froehlich, Chip Andrus, and Kevin Lautz.

b. Modeling Root Reinforcement in Shallow Forest Soils. Investigators: Arne Skaugset and Marvin Pyles.

c. Stability Assessment of End Haul Disposal Areas. Investigators: Marvin Pyles, Clint Davis, and Arne Skaugset.

d. Groundwater Movement in Steep Forested Hillslopes with Particular Focus on Marginally Stable "Headwalls". Investigators: Marvin Pyles and Mark Bransom.

e. Strength Behavior of Forest Soils Under True Field Stresses. Investigators: J. R. Bell and Marvin Pyles.

These studies represent both correlative or inventory research, and analytical research approaches. These approaches to solving slope stability problems for shallow, forested soils, differ considerably. Not only do they differ in methodology, but the information from each approach is quite different and will appeal to different audiences often with quite different skill levels. There is no doubt, however, that both approaches must be complementary. Therefore, a final synthesis product or "management tool" developed from both the inventory and analytical research approaches that uses the strong points of each and is practical, would be of great value to field personnel.

6. *Research Activities*:

a. Planned for FY 95:

Complete a literature review. Synthesize the research results available from the COPE slope stability research projects.

b. Tasks to be Completed by Fiscal Year Starting in FY 96:

Complete a manuscript on a "management tool" for steep, landslide-prone terrain with shallow, forest soils.

7. *Technology Transfer Activities Planned for FY 95*:

Participate in workshops, seminars, and field trips as appropriate.

8. *Estimated Cost*:

	OSU
FY 95	20,000
FY 96	21,000

9. *Duration of Study*:

Initiation Date	FY 95
Scheduled Completion Date:	FY 96

October 1994

Fundamental COPE
Work Plan

1. *Title*:

Laminated Root Rot of Douglas-fir in Western North America

2. *Principal Investigator(s) and Organization(s)*:

Dr. Walter G. Thies, Research Plan Pathologist, Pacific Northwest Research Station, Corvallis

Ms. Rona N. Sturrock, Canadian Forest Service, Victoria, British Columbia

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Reforestation in the Oregon Coast Range

Develop and test ways of reducing root rot damage.

4. *Study Objective(s)*:

To provide land managers with updated general information concerning laminated root rot and currently available mitigative strategies.

5. *Justification*:

Laminated root rot, caused by Phellinus weirii, affects all species of commercially important conifers in the Oregon Coast Range. When infected trees die, the pathogen continues to live saprophytically in dead roots for 50 years or more. Infection in a young stand begins when roots of young trees contact residual infested stumps and roots from the preceding stand. The fungus spreads between living trees through root contact and may take 25 years to kill a second growth Douglas-fir. Regenerating Douglas-fir or other highly susceptible species on a site infested with P. weirii nearly always results in continuation of the disease and subsequent losses in the new stand.

Laminated root rot is responsible for significant losses in the Oregon Coast Range. Using recently completed surveys by state and federal agencies we conservatively estimate that there are 300,000 acres of openings in the forests of the Oregon Coast Range caused by laminated root rot, with a nearly equal area populated by infected live trees.

Management of conifer stands in the Oregon Coast Range requires a working knowledge of laminated root rot in order to achieve desired future outcomes. This paper will be a concise statement of available information and our current understanding about the biology and management of this important disease.

6. *Research Activities*:

a. Planned for FY 95:

Complete initial drafts and reviews of the paper and send to the PNW Station editor.

b. Tasks to be Completed by Fiscal Year Starting in FY 96:

Complete revisions and deliver to the PNW Station Editor for publication.

7. *Technology Transfer Activities Planned for FY 95*:

This paper will be published as a PNW Station paper for distribution within Regions 1, 5, and 6 and the Canadian Forest Service.

8. *Estimated Cost*:

	PNW
FY 95	30,000
FY 96	50,000

9. *Duration of the Study*:

Initiation Date:	FY 95
Scheduled Completion Date:	FY 96

October 1994

Fundamental COPE
Work Plan

1. *Title*:

Integrated Resource Management Book

2. *Editorial Board Members*:

Dr. Stephen D. Hobbs, Professor, Department of Forest Science, College of Forestry, OSU, Corvallis

Dr. William C. McComb, Professor, Department of Forest Science, College of Forestry, OSU, Corvallis

Dr. Gordon H. Reeves, Research Fish Biologist, Pacific Northwest Research Station, Corvallis

Dr. Thomas A. Spies, Research Forester, Pacific Northwest Research Station, Corvallis

Many others will be involved in preparing this book. Adaptive and Fundamental COPE scientists will synthesize the information they have developed into individual book chapters.

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

All management issues and research tasks will be addressed.

4. *Study Objective(s)*:

Publish a book on integrated resource management in the Oregon Coast Range that synthesizes the information developed by COPE scientists and is written primarily for resource managers, specialists, and technicians.

5. *Justification*:

To date, the COPE Program has produced more than 155 publications that report research results that cover almost every aspect of the Program. This information appears in a wide variety of publication outlets that range from highly technical scientific journals to graduate student theses. Moreover, as the program nears closure and studies are completed, the types and volume of information will dramatically increase.

Experience has shown us that in general, on-the-ground managers, specialists, and technicians often do not have the time or the library resources readily available to seek out and integrate the information necessary to address complex problems. This is further complicated by the fact that some research results can be difficult to interpret, particularly with regard to their management implications. The net result is often a significant increase between the time new information is developed and when it is finally implemented. Although COPE scientists, and in particular the Adaptive Team, have done much to make the results of individual studies available to cooperators, a single-source document that integrates the results of many studies and provides a comprehensive, practical approach to the solution of management problems, is badly needed.

6. *Research Activities*:

a. Planned for FY 95:

Prepare a detailed publication plan.

Prepare a prospectus for each chapter.

b. Planned for FY 96:

Prepare a detailed outline (topical sentences) for each chapter.

Begin preparation of a first draft of each chapter.

Begin planning for the final COPE symposium.

c. Planned for FY 97:

Complete a first draft of each chapter.

Prepare a first revision of each chapter.

Complete the second and final revision of each chapter.

Complete final editing and initiate layout.

Continue symposium planning.

d. Planned for FY 98:

Complete layout, subject indexing and submit to publisher.

Publication completed and the final COPE symposium held.

7. *Estimated Cost*:

	OSU	PNW	TOTAL
FY 95	50,000	50,000	100,000
FY 96	100,000	100,000	200,000
FY 97	230,000	230,000	460,000
FY 98	160,000	160,000	320,000

8. *Duration of Study*:

Initiation Date	FY 95
Scheduled Completion Date:	FY 96

7

MultiDex™
Quick Reference Index System

RELATIONSHIP OF STUDIES TO MANAGEMENT ISSUES AND RESEARCH TASKS IDENTIFIED IN THE COPE LONG-RANGE PLAN[1]

Management Issue: RIPARIAN ZONE MANAGEMENT

Page

Research Task 1: Identify and explain the effects of various riparian and stream conditions on fish populations and communities.

Completed Studies

Juvenile Salmonid Macrodistribution and Habitat Availability in a Small Coastal Oregon Stream: A Basin-wide Seasonal Perspective

Influence of Geology on Response of Channel Morphology and Juvenile Salmonid Populations to Logging in Streams of the Oregon Coast Range

The Role and Management of Large Woody Debris for Fish Habitat in Coast Range Streams

Disturbance History, Channel State, Fish Habitat, and Fish Production in Sandstone Basins of the Central Oregon Coast 35

Estimation of Smolt Production from Drift Creek Study Basin 43

Long-Term Response of Resident Cutthroat Trout to Forest Harvest in Headwater Drainages of Oregon's Coast Range 129

Continuing Studies

Ecology and Inventory of Riparian Zone Vegetation 5

Fish Habitat and Riparian Zone Interactions 9

Behavior of Debris Torrents and Effects on Anadromous Fish Habitat in Oregon Coast Range 39

---

[1] A Long-Range Plan for completing the Coastal Oregon Productivity Enhancement (COPE) Program. April 1989. Forest Research Laboratory, Oregon State University, Corvallis. 15 p.

Page

Continuing Studies (continued)

The Utilization of Unconstrained Stream Reaches by Salmonids in the Oregon Coast Range 49

Evaluation of Anadromous Salmonid Habitat Restoration Program on Schooner Creek, Hebo Ranger District, Siuslaw National Forest 53

New Studies

None

Research Task 2: Identify and explain how various management practices in streams and riparian areas affect fish populations and communities and water quality.

Completed Studies

Influence of Geology on Response of Channel Morphology and Juvenile Salmonid Populations to Logging in Streams of the Oregon Coast Range

Forest Management on Landslide-Prone Sites: Stability Evaluation, Effectiveness of Leave Areas, and Effects of Landslides on Riparian and Fisheries Resources

Disturbance History, Channel State, Fish Habitat, and Fish Production in Sandstone Basins of the Central Oregon Coast 35

Estimation of Smolt Production From Drift Creek Study Basin 43

Long-Term Response of Resident Cutthroat Trout to Forest Harvest in Headwater Drainages of Oregon's Coast Range 129

Continuing Studies

Fish Habitat and Riparian Zone Interactions 9

Hybrid Poplar in Coastal Riparian Zones for Non-point Source Pollution Control, Fish and Wildlife Habitat, and Wood Fiber 19

Behavior of Debris Torrents and Effects on Anadromous Fish Habitat in the Oregon Coast Range 39

Page

Continuing Studies (continued)

The Utilization of Unconstrained Stream Reaches by Salmonids in the Oregon Coast Range 49

Evaluation of Anadromous Salmonid Habitat Restoration Program on Schooner Creek, Hebo Ranger District, Siuslaw National Forest 53

Active Management of Riparian Zones for Multiple Resources: III. Influence of Woody Debris Piece Size on Function in Small Streams 121

Integrated Response of Multiple Forest Resources to Active Management in Riparian Zones of the Oregon Coast Range 133

New Studies

None

Research Task 3: Identify wildlife species in and adjacent to riparian habitats.

Completed Studies

Patterns of Wildlife Abundance and Diversity in Managed Upland Forest Landscapes

Habitat Relationships of Arboreal Rodents in Managed Forests in the Oregon Coast Range 137

Continuing Studies

Wildlife Habitat and Wildlife Diversity in Riparian Zones: A Gradient Approach 13

Habitat Relationships and Riparian Zone Associations of Bats in Managed Forests in the Oregon Coast Range 141

Influence of Snag Creation and Commercial Thinning Intensity on Stand Structure and Bird Abundance and Diversity in Managed Forests in the Oregon Coast Range 149

New Studies

None

Page

Research Task 4: Characterize wildlife communities in riparian and adjacent upland habitats and assess how changes in habitat affect wildlife species.

Completed Studies

Patterns of Wildlife Abundance and Diversity in Managed Upland Forest Landscapes

Adaptation of a Forest Succession and Wildlife Habitat Model to Managed Coast Range Forests

Habitat Relationships of Arboreal Rodents in Managed Forests in the Oregon Coast Range 137

Continuing Studies

Ecology and Inventory of Riparian Zone Vegetation 5

Wildlife Habitat and Wildlife Diversity in Riparian Zones: A Gradient Approach 13

Ecology and Habitat Relationships of Selected Riparian-Associated Wildlife 45

Habitat Relationships and Riparian Zone Associations of Bats in Managed of Bats in Managed Forests in the Oregon Coast Range 141

Application of Commercial Thinning to Increase Structural Diversity in Young Douglas-fir Stands 145

Influence of Snag Creation and Commercial Thinning Intensity on Stand Structure and Bird Abundance and Diversity in Managed Forests in the Oregon Coast Range 149

New Studies

None

Page

Research Task 5: Develop silvicultural systems to maintain and improve fish and wildlife habitats in riparian areas and increase conifer development there.

Completed Studies

None

Continuing Studies

Ecology and Inventory of Riparian Zone Vegetation 5

Fish Habitat and Riparian Zone Interactions 9

Wildlife Habitat and Wildlife Diversity in Riparian Zones: A Gradient Approach 13

Hybrid Poplar in Coastal Riparian Zones for Non-point Source Pollution Control, Fish and Wildlife Habitat, and Wood Fiber 19

The Dynamics and Silviculture of Riparian Vegetation 29

Ecology and Habitat Relationships of Selected Riparian-Associated Wildlife 45

Establishment and Growth of Conifers Under Existing Riparian Vegetation 113

Active Management of Riparian Zones for Multiple Resources: II. Release of Suppressed and Intermediate Conifers in Alder-Dominated Riparian Zones of the Oregon Coast Range 117

Integrated Response of Multiple Forest Resources to Active Management in Riparian Zones of the Oregon Coastal Range 133

New Studies

None

Research Task 6: Test and compare harvesting systems that enable managers to achieve various states of fish and wildlife habitat and levels of timber production in riparian areas.

Completed Studies

None

Page

Continuing Studies

Harvesting Alternatives in Upland and Riparian Areas in the Oregon Coast Range 65

Integrated Response of Multiple Forest Resources to Active Management in Riparian Zones of the Oregon Coast Range 133

New Studies

None

Research Task 7: Develop, refine, and test systems for predicting and reducing landslides, surface erosion, and sediment delivery to stream channels.

Completed Studies

Forest Management on Landslide-Prone Sites: Stability Evaluation, Effectiveness of Leave Areas, and Effects of Landslides on Riparian and Fisheries Resources

Ground Water Movement in Steep Forested Hill-Slopes with Particular Focus on Marginally Stable "Head-Walls" 23

Continuing Studies

Behavior of Debris Torrents and Effects on Anadromous Fish Habitat in the Oregon Coast Range 39

Strength Behavior of Forest Soils Under True Field Stresses 57

Modeling Root Reinforcement in Shallow Forest Soils 109

Stability Assessment of End-Haul Disposal Areas 125

New Studies

Slope Stability Synthesis 165

Page

Research Task 8: Develop economic models capable of assessing the economic impacts of various management regimes in riparian zones, and apply them to conditions prevailing prevailing on the Oregon coast.

Completed Studies

Evaluating the Socio-Economic Ramifications of Alternative Forest Resource Management Options in Coastal Oregon

Cost of Producing Additional Non-Timber Outputs from Riparian Zones

Continuing Studies

Economic Analysis of Forest Management-Fisheries Interactions 69

New Studies

None

Research Task 9: Identify and integrate associations among ecosystem components (for example,vegetation, geomorphology, fish) in riparian areas and explain their ecological relationships.

Completed Studies

Forest Management on Landslide-Prone Sites: Stability Evaluation, Effectiveness of Leave Areas, and Effects of Landslides on Riparian and Fisheries Resources

Continuing Studies

Ecology and Inventory of Riparian Zone Vegetation 5

Fish Habitat and Riparian Zone Interactions 9

Wildlife Habitat and Wildlife Diversity in Riparian Zones: A Gradient Approach 13

Continuing Studies (continued) *Page*

Coastal Landscape Analysis and Modeling 25

Harvesting Alternatives in Upland and Riparian Areas in the Oregon Coastal Range 65

New Studies

Integrated Resource Management Book 169

Management Issue: REFORESTATION IN THE OREGON COAST RANGE

Page

Research Task 1: Develop and test strategies for reforestation that will be effective wherever coastal forests grow, even with constraints on prescribed fire and herbicides.

Completed Studies

Prescribed Fire in Pacific Northwest Forests: An Analysis of the Effect of Slash Burning on the Number and Distribution of Planting Spots and Planting Productivity on Sites in the Oregon Coast Range

Reducing Air Pollution From Hardwood Conversion Burning in Coastal Oregon

A Diagnostic Tool for Predicting the Effects of Interspecific Competition on Growth and Yield of Douglas-fir

Environment and the Natural Regeneration of Conifers

Effects of Time of Manual Cutting on Resprouting of Salmonberry

A Synthesis of Reforestation Practices with Constraints on Fire and Herbicides

Characterization of the Thermal Environment for Developing Guidelines to Manage Shrubs and Hardwoods in Coastal Forests

Continuing Studies

Ecology and Management of Shrubs and Hardwoods in Coastal Forests 77

Second Decade Effects of Site Preparation on Tree and Vegetation Development With or Without Precommercial Thinning 81

Decision Support System for Reforestation in the Oregon Coast Range 95

Understory Response to Commercial Thinning in Young Douglas-fir Stands 99

The Application of Commercial Thinning to Increase Structural Diversity in Young Douglas-fir stands 145

Influence of Snag Creation and Commercial Thinning Intensity on Stand Structure and Bird Abundance and Diversity in Managed Forests in the Oregon Coast Range 149

Page

New Studies

None

Research Task 2: Examine the economics of different reforestation strategies and assess the economic impacts of constraints on fire and herbicides.

Completed Studies

The Effects of Slash Burning on the Number and Distribution of Planting Spots and Planting Productivity on Sites in the Oregon Coast Range

A Synthesis of Reforestation Practices With Constraints on Fire and Herbicides

A Diagnostic Tool for Predicting the Effects of Interspecific Competition on Growth and Yield of Douglas-fir

Environment and the Natural Regeneration of Conifers

Effects of Time of Manual Cutting on Resprouting of Salmonberry

Continuing Studies

Ecology and Management of Shrubs and Hardwoods in Coastal Forests 77

Second Decade Effects of Site Preparation on Tree and Vegetation Development With and Without Precommercial Thinning 81

Economic Strategies and Analysis of Regeneration Alternatives in Coastal Oregon with Constrained Site Treatment Alternatives 103

The Application of Commercial Thinning to Increase Structural Diversity in Young Douglas-fir Stands 145

Influence of Snag Creation and Commercial Thinning Intensity on Stand Structure and Bird Abundance and Diversity in Managed Forests in the Oregon Coast Range. 149

New Studies

None

Page

Research Task 3: Identify the effects of prescribed fire on long-term site productivity and develop methods to reduce adverse impacts.

Completed Studies

Prescribed Fire in Pacific Northwest Forests: An Analysis

Asymbiotic Nitrogen Fixation in Large Woody Residues of Oregon Coastal Forests

Reducing Air Pollution From Hardwood Conversion Burning in Coastal Oregon

Characterization of the Thermal Environment for Developing Guidelines to Manage Shrubs and Hardwoods in Coastal Forests

Continuing Studies

Second Decade Effects of Site Preparation on Tree and Vegetation Development With and Without Precommercial Thinning 81

New Studies

None

Research Task 4: Develop and test ways of reducing root rot damage in new plantation.

Completed Studies

The Influence of Tree Vigor on Infestation of Douglas-fir by *Phellinus weirii*

Chemical Control of *Phellinus* (*Poria*) *Weirii* Part III--Application of Chloropicrin or Methyl Isothiocyanate (MS) to Live Infected Trees

Rate of Spread of *Phellinus Weirii* in Living and Dead Root Systems 93

Continuing Studies

Species Manipulation as a Strategy to Reduce the Impact of Laminated Root Rot in Regenerated Coastal Stands 85

Characterization of *Trichoderma* spp.: Prelude to Biological Control 89

Page

New Studies

Laminated Root Rot of Douglas-fir in Western North America 167

Research Task 5: Identify relationships between wildlife populations, habitat, and damage to young conifer plantations (second priority).

Completed Studies

Patterns of Wildlife Abundance and Diversity in Managed Upland Forest Landscapes

Adaptation of a Forest Succession and Wildlife Habitat Model to Managed Coast Range Forests

Continuing Studies

The Application of Commercial Thinning to Increase Structural Diversity in Young Douglas-fir Stands 145

New Studies

None

Research Task 6: Develop conceptual models of habitat manipulation in order to learn how to minimize animal damage to young conifer plantations (second priority).

Completed Studies

Patterns of Wildlife Abundance and Diversity in Managed Upland Forest Landscapes

Adaptation of a Forest Succession and Wildlife Habitat Model to Managed Coast Range Forests

Continuing Studies

None

New Studies

None

Management Issue: **THESE STUDIES ENCOMPASS BOTH RIPARIAN ZONE MANAGEMENT AND REFORESTATION IN THE OREGON COAST RANGE**

Page

Completed Studies

Socioeconomic Research Feasibility Study

Management Policies for Increasing Recreation's Contribution to the Economics of Oregon Coast Range Communities 73

Habitat Relationships of Arboreal Rodents in Managed Forests in the Oregon Coast Range 137

Continuing Studies

Coastal Landscape Analysis and Modeling 25

Integrating and Managing Recreation with Other Resources 59

Harvesting Alternatives in Upland and Riparian Areas in the Oregon Coast Range 65

Economic Strategies and Analysis of Regeneration Alternatives in Coastal Oregon with Constrained Site Treatment Alternatives 103

The Application of Commercial Thinning to Increase Structural Diversity in Young Douglas-fir Stands 145

Influence of Snag Creation and Commercial Thinning Intensity on Stand Structure and Bird Abundance and Diversity in Managed Forests in the Oregon Coast Range 149

Pruning and Fertilizing Precommercially Thinned Douglas-fir Stands in the Oregon Coast Range 153

New Studies

Integrated Resource Management Book 169

MultiDex™
Quick Reference Index System

8

October 1994

Fundamental COPE

Combined OSU and PNW Budget Summary
FY 94 and FY 95

Projected Expenditures

	FY 94 (anticipated)	FY 95 (anticipated)
OSU[1]	$ 924,000	$ 936,000
PNW[1]	1,282,000	1,178,000
Total	**$2,206,000**	**$2,114,000**

Revenues

	FY 94 (appropriation)	FY 95 (anticipated)
USDA, FS	$1,050,000	$ 965,000
USDI, NBS/BLM	1,156,000	1,149,000
Total	**$2,206,000**	**$2,114,000**

---

[1] Includes funds necessary for program administration and research support services.

October 1994

Adaptive COPE

Budget Summary
FY 94 and FY 95

Expenditures	FY 94 (actual)	FY 95 (projected)
Personnel (salaries, wages, and OPE)	$419,700	$379,000
Services and Supplies	58,300	75,000
Travel	51,300	65,000
Capital Costs (equipment, facilities)	9,700	7,500
Indirect Costs	20,000	26,000
Tuition Remission	0	0
Total	$559,000	$552,500

Revenues	FY 94 (actual)	FY 95 (requested)
NBS/BLM	$144,000	$151,000
National Forests	100,000	100,000
Industry	138,700	150,000
Oregon Dept. of Forestry	80,000	80,000
Counties	27,500	27,500
Oregon Dept. Fish & Wildlife	5,000	5,000
Oregon Small Woodland Assoc.	300	300
U.S. Fish & Wildlife	5,000	5,000
Bureau of Indian Affairs	5,000	5,000
City of Newport	1,000	1,000
Carryover	221,400	168,900
Total	$727,900	$693,700

COLLEGE OF FORESTRY

#1227319043

ID: 88069915

QH
541.5
.C65
C637
1994b

OREGON
STATE
UNIVERSITY

Peavy Hall 154
Corvallis, Oregon
97331-5704

Fax
503-737-2668

November 7, 1994

MEMORANDUM

TO: COPE Advisory Council Members and Invited Participants

FROM: Steve Hobbs

SUBJECT: Fall Advisory Council Meeting

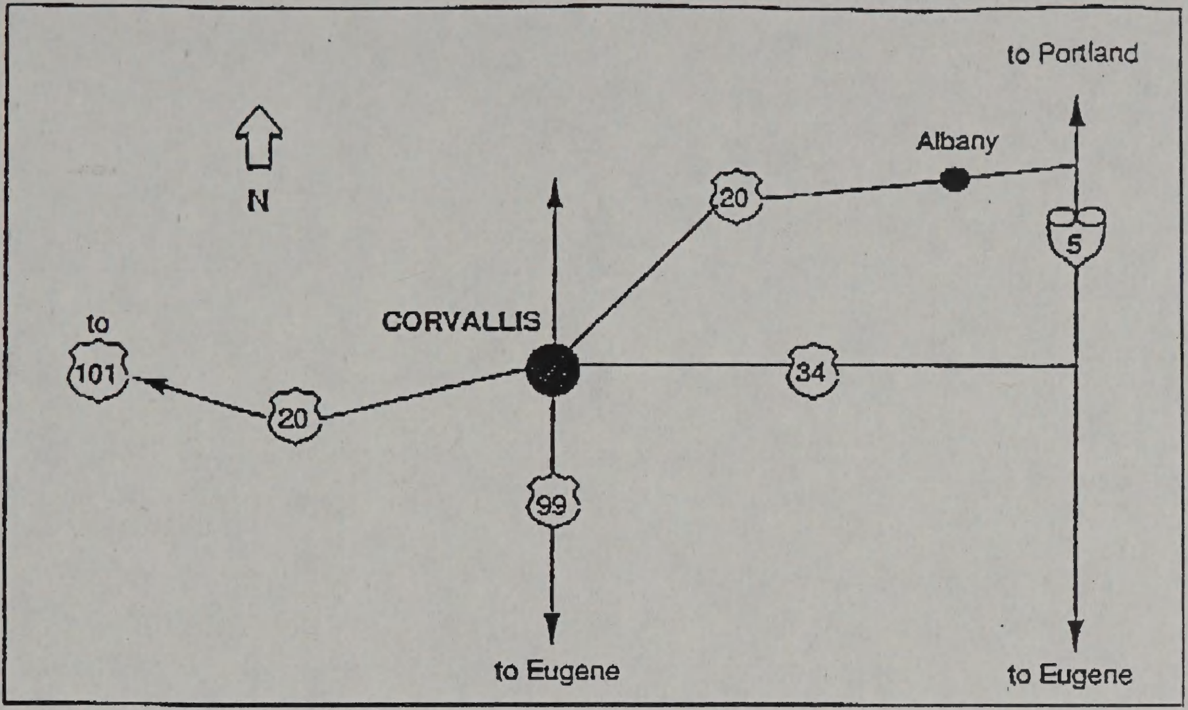
The fall meeting of the COPE Advisory Council will be held in the Agriculture Science Room at the LaSells Stewart Center on the OSU campus, November 22, 1994. We will start at 10:00 a.m. and adjourn by 2:00 p.m. Lunch will be provided. Parking is available directly across the street from the Center (see attached map).

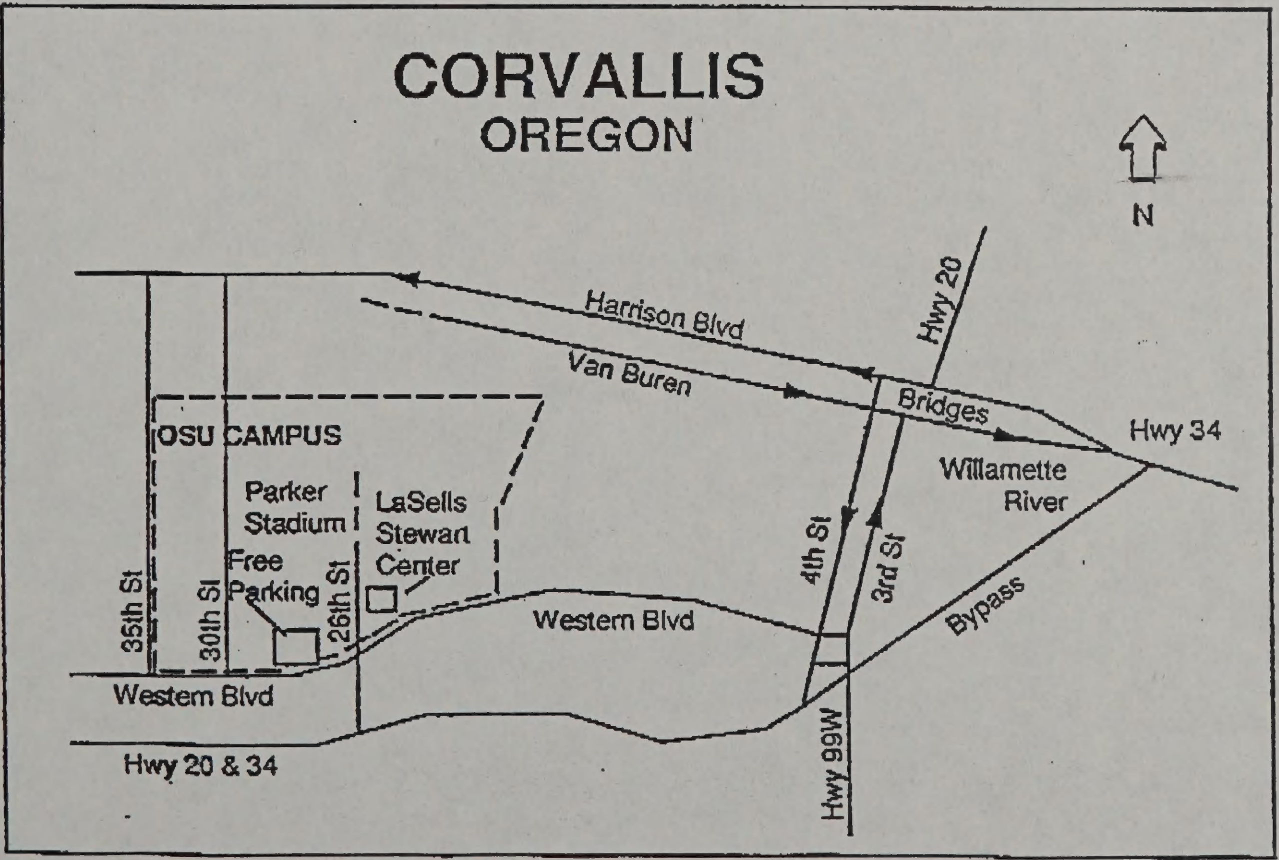
The COPE FY 94 Annual Report is enclosed for your review. Included are the meeting agenda, minutes to the last Advisory Council meeting, annual reports on all Fundamental and Adaptive studies for FY 94 and plans for FY 95. Also enclosed is the COPE Bibliography updated through FY 94.

If you will be unable to attend the meeting, please let me (750-7426) or Vicki Verdugo know (750-7331) by November 16. I hope you'll be able to join us and I look forward to seeing you on the twenty-second.

Enclosures

BLM LIBRARY


to Portland
Albany
N
20
5
to
101
CORVALLIS
20
34
99
to Eugene
to Eugene


CORVALLIS
OREGON
N
Hwy 20
Harrison Blvd
Van Buren
Bridges
Hwy 34
Willamette
River
OSU CAMPUS
Parker
Stadium
LaSells
Stewart
Center
Free
Parking
35th St
30th St
26th St
4th St
3rd St
Western Blvd
Bypass
Western Blvd
Hwy 20 & 34
Hwy 99W

#1227319043 ID:88069915

COLLEGE OF FORESTRY

FILE COPY

COOS BAY DISTRICT OFFICE

Nov 16 11 37 AM '94

REC

QH
541.5
.C65
C637
1994b

November 14, 1994

OREGON
STATE
UNIVERSITY

Peavy Hall 154
Corvallis, Oregon
97331-5704

Fax
503-737-2668

MEMORANDUM

TO: COPE Advisory Council Members

FROM: Steve Hobbs

SUBJECT: COPE Beyond 1998

Attached for your review prior to our November 22 meeting is an outline of alternative proposals for continuing selected COPE studies beyond 1998 when the program is currently scheduled to be completed. As you may recall, during our last meeting the Council asked that I develop alternative approaches for consideration during the fall meeting. These will be discussed during the afternoon session on November 22 with the objective of narrowing the field of options so that a more detailed plan can be developed.

If you need additional information prior to the meeting, please don't hesitate to call me (750-7426). I look forward to seeing you next week.

Attachment

	Initials /date
b DM	
ADM	
PA	
PECS	
RES	
FOR	
OPS	
ADMIN	
UAM	
TAM	
MAM	
ACTION	

BLM LIBRARY

COPE Beyond 1998

During their June 1994 meeting, the COPE Advisory Council recognized the importance of continuing some COPE studies beyond 1998. In particular they noted that studies that have involved operational scale vegetation or riparian zone manipulations may not yield their most significant results until 10 to 15 years after treatment installation. Accordingly, the Chair of the Advisory Council asked the program leadership to develop several options for continuing appropriate studies beyond 1998.

The proposal for continuation of COPE beyond 1998 is divided into two parts. The first part lists the individual studies proposed for continuation while the second outlines several approaches for achieving this.

I. Current Studies Proposed for Continuation

Studies A and B are Fundamental COPE studies that would be continued by PNW scientists and supported with PNW funds. Studies C through F are Adaptive COPE studies and would require cooperator funding.

A. The Dynamics and Silviculture of Riparian Vegetation (Riparian tree regeneration only; Fundamental COPE Study; PNW funded; FY 94 Annual Report, p. 29)

B. Understory Response to Thinning in Young Douglas-fir Stands (Fundamental COPE Study; PNW funded; FY 94 Annual Report, p. 99)

C. Active Management of Riparian Zones for Multiple Resources: III. Influence of Woody Debris Piece Size on Function in Small Streams. (Adaptive COPE Study; Cooperator funded; FY 94 Annual Report, p. 121)

D. Integrated Response of Multiple Forest Resources to Active Management in Riparian Zones of the Oregon Coast Range (Adaptive COPE Study; Cooperator funded; FY 94 Annual Report, p. 133)

E. The Application of Commercial Thinning to Increase Structural Diversity in Young Douglas-fir Stands (Adaptive COPE Study; Cooperator funded; FY 94 Annual Report, p. 145)

F. Influence of Snag Creation and Commercial Thinning Intensity on Stand Structure and Bird Abundance and Diversity in Managed Forests in the Oregon Coast Range (Adaptive COPE Study; Cooperator funded; FY 94 Annual Report, p. 149)

II. Organizational and Funding Options (Adaptive Studies Only)

A. One-Time Funding; No Technology Transfer Component

1. *Concept*: Research conducted by Oregon State University scientists. Oversight of individual studies would rest with the appropriate academic department with funds disbursed by the Dean's Office as needed to complete periodic measurements, data analysis, and the publication of results. This option would dismantle the Adaptive COPE Team infrastructure.

2. *Duration*: 10 years; completion in 2008.

3. *Funding*: Cooperators would make a one-time payment at the beginning of FY 99. The estimated total cost would be between $1,300,000 and $1,600,000.

4. *Cooperator Involvement*: Could vary from no involvement to annual meetings of the Advisory Council. Individual cooperators with studies on their lands would continue their involvement in those particular studies.

5. *Advantages*:

    a. Assures funding up-front.

    b. Provides for regular data collection, analysis, and the publication of study results.

6. *Disadvantages*:

    a. Does not allow for budget flexibility to cover unanticipated costs.

    b. Does not provide the flexibility necessary to respond to new research opportunities.

    c. Does not provide continual technology transfer to cooperators.

    d. Does not maintain the COPE network among scientists and cooperators.

    e. It is unlikely that upfront funds of $1,300,000 to $1,600,000 could be raised in FY 1999.

    f. It is unlikely that cooperators would be made aware of research results as quickly as is currently the case.

B. Annual Funding; No Technology Transfer Component

1. *Concept*: Research conducted by Oregon State University scientists. The oversight of individual studies would rest with the appropriate academic department with funds disbursed by the Dean's Office as needed to complete periodic measurements, data analysis, and the publication of results. This option would dismantle the Adaptive COPE Team infrastructure.

2. *Duration*: 10 years through FY 2008 with a major review regarding continuation at the end of the fifth year (FY 2003).

3. *Funding*: Funding would be set annually following the current procedure used by the Advisory Council. The estimated total cost would vary by year depending on the research activities required. For example, in FY 1999 the estimated cost would be between $200,000 and $225,000 whereas in FY 2000 it would be between $40,000 and $60,000.

4. *Cooperator Involvement*: The Advisory Council would meet annually to review progress and set the coming year's budget. Individual cooperators with studies on their lands would continue their involvement in those particular studies.

5. *Advantages*:

   a. Maintains cooperator involvement at the Advisory Council level.

   b. Provides for regular data collection, analyses and publication of results.

   c. Allows for budget flexibility to cover unanticipated costs.

   d. Does allow for limited flexibility to respond to new research opportunities provided adequate funds are made available.

6. *Disadvantages*:

   a. Does not provide continual technology transfer to cooperators.

   b. Does not maintain the COPE network among scientists and cooperators.

   c. There is potential uncertainty of obtaining adequate funding from one year to the next.

   d. It is unlikely that cooperators would be made aware of research results as quickly as is currently the case.

C. Annual Funding; Includes a Technology Transfer Component

1. *Concept*: The Adaptive COPE Team would be continued but with its FTE reduced from 10.4 to 5.2. One of the Adaptive Team scientists would serve as overall coordinator of the extended COPE effort.

2. *Duration*: Ten years through FY 2008 with a major review regarding continuation at the end of the fifth year (FY 2003).

3. *Funding*: Funding would be set annually following the current procedure used by the Advisory Council. The estimated annual cost for the first year (FY 1999) would be between $320,000 and $440,000 depending on whether the Team is based in Newport or Corvallis.

4. *Cooperator Involvement*: The Advisory Council would meet annually to review progress and set the coming year's budget. All cooperators would continue to be involved, as is currently the case, through the COPE network and ongoing technology transfer efforts.

5. *Advantages*:

    a. Maintains cooperator involvement at all levels.

    b. Provides for regular data collection, analyses and publication of results.

    c. Allows for budget flexibility to cover unanticipated costs.

    d. Allows for more flexibility than options A and B to respond to new research opportunities.

    e. Provides for continued technology transfer activities such as the newsletter COPE Report, workshops, and field trips, but at a somewhat reduced level than is currently the case.

    f. Maintains the COPE network among scientists and cooperators.

    g. Program leadership and administrative responsibilities are clearly established and focused.

    h. Accountability could be more clearly monitored.

    i. The time frame for making new information available to cooperators would be shorter than that associated with options A and B.

In Kind
does -

NBS Jappenicus Study
Dens Mc
Ros, Evg, Scal.

6. *Disadvantage*:

   a. The cost of this option is higher than options A and B.

   b. Does not allow for as much flexibility to respond to new research opportunities as option D.

   c. Does not allow for as much technology transfer as option D.

   d. There is potential uncertainty of obtaining adequate funding from one year to the next.

D. Annual Funding; Full Adaptive COPE Component

1. *Concept*: Under this option, the Adaptive COPE Team would retain its current 10.4 FTE. One of the Adaptive Team scientists would serve as overall coordinator of the extended COPE effort.

2. *Duration*: Ten years through FY 2008 with a major review regarding continuation at the end of the fifth year (FY 2003).

3. *Funding*: Funding would be set annually following the current procedure used by the Advisory Council. The estimated annual cost for the first year (FY 1999) would be between $612,000 and $824,000 depending on whether the Team is based in Newport or Corvallis.

4. *Cooperator Involvement*: The Advisory Council would meet annually to review progress and set the coming year's budget. All cooperators would continue to be involved, as is currently the case, through the COPE network and ongoing technology transfer efforts.

5. *Advantages*:

   a. Maintains cooperator involvement at all levels.

   b. Provides for regular data collection, analyses and publication of results.

   c. Allows for budget flexibility to cover unanticipated costs.

   d. Allows for more flexibility than other options to respond to new research opportunities.

   e. Provides for continued technology transfer at the current level of delivery.

f. Maintains the COPE network among scientists and cooperators.

g. Program leadership and administrative responsibilities are clearly established and focused.

h. Accountability would continue to be clearly monitored.

i. The time frame for making new information available to cooperators would be faster than other options.

6. *Disadvantage*:

   a. The cost of this option is higher than other options.

   b. There is potential uncertainty of obtaining adequate funding from one year to the next.